DIVISION 2
SITE WORK

SECTION 02016

PROTECTING AND RELOCATING UTILITIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, equipment and materials as required to locate and protect underground and above ground utilities.

B. Coordinate work with other trades and utility companies.

C. Obtain permit and provide traffic control as required.

1.02 JOB CONDITIONS

A. The locations of existing utilities, ditches, conduits, and underground structures shown on the plans are approximate only.

B. The location of above ground and underground facilities and structures have been inferred from other records as stated in the General Conditions of the Construction and Development Agreements.

C. Unless specified otherwise, the raising, lowering, or relocation of portions of interfering utilities is the responsibility of the utility company or utility owner.

D. Protect and support, by timbers or otherwise, all pipes, conduits, poles, wires or other apparatuses of Public and Private Utilities that the work may affect, and do everything to support, sustain and protect the same, under, over, along or across said work.

PART 2 EXECUTION

2.01 PREPARATION

A. Contact "Blue Stakes" to stake and mark the location of utilities 48 hours before commencement of construction.

B. Contact other utility owners which "Blue Stakes" does not mark, to have them locate their facilities. For signal line locations, contact Salt Lake County at 562-6452 (562-6418 after hours), 48 hours before commencement of work.

C. Pothole, expose, or otherwise locate all such facilities as necessary to give the utility companies at least forty-eight (48) hour notices to protect or relocate all utility facilities that may interfere with or be damaged by the contractor's operations. Note: Pot-holes to be restored in accordance with Public Works Department Policy for Restoring Utility Pot-holes. Note: Potholes to be restored in accordance with Public Works Department Policy for Restoring Utility Pot-holes.

D. Commence excavation only after all utilities have been located.

2.02 UTILITIES TO BE RELOCATED BY OTHERS

A. Support and protect natural gas lines, telephone, fiber optic, electric, oil, television, water lines, sanitary sewers, storm drains, etc., in those areas where these facilities parallel, cross over, or cross under the Work.

B. Notify the utility company so that they can arrange to protect or relocate the utility facility.

2.03 UTILITIES TO BE RELOCATED BY CONTRACTOR

A. Notify affected property owners in writing at least forty-eight (48) hours before interruption of service.

B. Do not interrupt service unless coordinated with utility companies.

C. The contractor will be responsible for any damage done to any street or other public property, or to any private property by reason of the breaking of any water pipe, sewer pipe, gas pipe, electric conduit, or other utility by or through his negligence.

2.04 SPECIAL LIQUIDATED DAMAGES

A. Should any of the interconnecting traffic signal lines and thus the synchronization between intersections be disrupted, the contractor will pay the City not only for the costs associated with the necessary repairs, but also pay the City as liquidated damages one dollar per hour per signalized intersection until signal synchronization is restored. Interconnecting lines may control the synchronization of one to eight intersections.

B. Lines not shown on the plans or identified on-site by the Engineer or Sandy Traffic personnel are exempt from these requirements.

END OF SECTION

SECTION 02115

CONCRETE AND ASPHALT PAVEMENT REMOVAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Removal of Portland Cement concrete paving, such as roadways, curbs, gutters, sidewalks, driveways and alley intersections in the designated work area.

B. Removal of asphalt concrete paving.

C. Legal disposition of all excavated materials.

D. Filling of all holes or pits left by the removal.

E. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02016 - Protecting and Relocating Utilities

C. Section 02121 - Structures and Obstruction Removal

PART 2 EXECUTION

2.01 PREPARATION

A. Notify all affected utility companies and Blue Stakes before commencing work of this section.

B. Review all work procedures with Engineer before commencing any work.

C. Preserve in operating condition all active utilities traversing the site and designed to remain (if any) by a means approved by the Engineer and the respective utility company or agency.

D. Disturbed subgrade material or aggregate base resulting from removal of existing pavements for final edge preparation will be re-compacted to an average of 96% of the laboratory maximum density as determined by AASHTO Test Method T-180.

2.02 SIDEWALK, CURBING AND DRIVEWAY OR ALLEY APPROACHES

A. Remove concrete to the nearest crack control joint or score line by saw cutting full depth.

B. Do not damage adjacent concrete surfaces that are not scheduled for removal.

C. Replace damaged section of remaining concrete sections at no cost to the City.

D. Make all concrete cuts straight and true.

2.03 ROADWAY PAVEMENT REMOVAL

A. Remove bituminous pavements to neatly sawed edges. Saw cut, full depth, all pavements to be removed. Where only the surface of existing bituminous pavement is to be removed, obtain approval of method from the Engineer. Where bituminous pavement adjoins a trench, the edges adjacent to the trench will be trimmed to neat straight lines before resurfacing to ensure that all areas to be resurfaced are accessible to the rollers used to compact the subgrade or paving materials.

B. Remove Portland Cement Concrete pavement to neatly sawed edges. Saw cut, full depth, all pavement to be removed. If a saw cut in Portland Cement concrete pavement falls within 3 feet of a construction joint, cold joint, expansion joint, or edge, the concrete will be removed

to the joint or edge. The edges of existing Portland Cement concrete pavements adjacent to trenches where damaged subsequent to saw cutting of the pavement, will again be saw cut to neat straight lines for the purpose of removing the damaged pavement areas. Such saw cuts will be either parallel to the original saw cuts or cut on an angle that departs from the original saw cut not more than 1 inch in each six inches.

C. Concrete Curb, Walk, Gutters, Waterways, Driveways, and Alley Intersections: Concrete will be removed to neatly sawed edges, with saw cuts made to minimum depth of 1-1/2 inches. Concrete sidewalk or driveway to be removed will be neatly sawed in straight lines, either parallel to the curb or at right angles to the alignment of the sidewalk. No sidewalk section to be replaced will be shorter than 4 feet in length, full width. No curb and gutter to be replaced will be shorter than 10 feet in length or as specified by the Engineer.

D. Where existing street pavement extends beyond the back of the new curb line, the Contractor will also be required to remove the pavement beyond the project limit as part of the excavation.

2.04 PROTECTION OF PAVED SURFACES OUTSIDE OF WORK AREA

A. Use rubber cleats or pavement pads when operating backhoes, outriggers, track equipment, or any other equipment on or crossing paved surfaces.

B. Remove any paving outside the work which removal operation damages. Replace the paving at no cost to the City.

2.05 REMOVAL AND DISPOSAL OF MATERIAL

A. Remove all debris from the site and leave the site in a neat and orderly condition daily or as directed by the Engineer.

B. Dispose of removed materials in conformance with all ordinances.

END OF SECTION

SECTION 02121

STRUCTURES AND OBSTRUCTIONS REMOVAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials and equipment as required for the removal and disposal of all structures and\or obstructions within the designated work area, including buildings, basements, foundations, bridges, culverts, fences, guardrail, miscellaneous concrete work, septic tanks, or other items that would interfere with the proposed construction.

B. Contact affected utilities and arrange for and\or disconnect and properly abandon all utilities where required.

C. Fill and compact all holes or pits left by the removal as required.

D. Salvage equipment and materials designated by the City for salvage as noted on drawings or specifications.

E. All other salvageable materials become the property of the Contractor unless owned by others. Remove to a location away from the construction site.

a. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02016 - Protecting and Relocating Utilities

C. Section 02220 - Excavation

D. Section 02240 - Backfill, Compaction, and Embankment

PART 2 PRODUCTS

2.01 EXPLOSIVES

A. Do not use explosives on this work except as approved in writing by the Engineer.

PART 3 EXECUTION

3.01 PREPARATION

A. Before starting any work under this section, notify all affected utility companies, including but not limited to Sandy City Public Utilities and Blue Stakes.

B. Review all removal procedures with Engineer before starting any work.

C. Notify Engineer at least forty-eight (48) hours before commencing work of this section.

3.02 BUILDING, BASEMENT, AND FOUNDATION REMOVAL

A. Retain and protect all active utilities designated to remain in service.

B. Move or demolish the buildings shown on the plans or listed in the special provisions, including all other incidental structures and obstructions such as basements and foundations, sidewalks, pavement and slabs, fences and outbuildings serving as part of a parcel unit, and remove and dispose of all material in a satisfactory manner. Comply with all Federal, State, and local laws and regulations for disposal of materials.

C. Plug disconnected sewer lines near the right-of-way line with a watertight concrete plug

extending into the remaining pipe at least two (2) feet and as directed by the utility. If there is a septic tank, remove it and backfill the hole with granular material and compact according to the requirements of Section 02230 and 02240.

D. Disconnect water services by excavating the corporation stops and turning them off. Disconnect the service lines from the corporation stops.

E. Remove basement walls and foundations at least two (2) feet below the finished grade or two (2) feet below the natural ground surface, whichever is the lowest. Remove the basement floor.

F. Fill the holes left by the basement foundations and other structures with granular borrow and backfill as per Sections 02230 and 02240.

3.03 BRIDGES AND CULVERTS

A. Remove existing bridges and culverts where specified on the plans or in the special provisions.

B. Remove structures to such an extent that no remaining portion is closer than three (3) feet to any water course or closer than two (2) feet to the subgrade and embankment surface, or within one (1) foot of the natural ground surface.

C. Remove pipe culverts, if specified for salvaging or relaying, so the culvert or pipe is not damaged.

D. If backfilling is required, use granular borrow as per Sections 02230 and 02240.

3.04 MISCELLANEOUS

A. Remove and dispose of all other structures and obstructions, including fences, vaults, valve boxes, miscellaneous concrete structures, guard rails, old pavements, and trash within the construction limits.

B. The City is not responsible for any vandalism or theft that occurs to the buildings or its content which reduces the value of the salvage or increases the cost of removal.

Fill holes left by removal of miscellaneous items or other structures with granular borrow as per Section 02230 and 02240.

END OF SECTION

SECTION 02214

SHORING AND BRACING TRENCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. CRIBBING AND SHEETING - SHORING: The Contractor will provide all material, labor, and equipment necessary to adequately shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. The methods of shoring tunneling, boring, sliding trench shields, etc. will be according to the Contractor's design provided the method is in conformance with the Utah Occupational Safety and Health Rules and Regulations of the Utah State Industrial Commission.

B. The work of this section applies to all open excavations which require a protective system. Additional shoring may be required by the Engineer.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02220 - Excavation

C. Section 02240 - Backfill, Compaction, and Embankment

D. U.S. Department of Labor Occupational Safety and Health Standards (OSHA 2207 - 29 CFR Part 1926)

END OF SECTION

SECTION 02220

EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to perform all excavation for structures, trenches, roadways, disposal of excess material, dust control and drainage.

B. Construct and remove all required asphalt, shoring, cribs, cofferdams, caissons, including all pumping, bailing, draining, sheeting, bracing and related items.

C. Protect existing facilities, utilities, and structures affected by the excavation.

D. Secure all appropriate permits for the work.

E. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02016 - Protecting and Relocating Utilities

C. Section 02214 - Shoring and Bracing Trenches

D. Section 02230 - Materials

E. Section 02240 - Backfill, Compaction, and Embankment

F. Section 02433 - Non-pressure Pipe Installation

G. Section 02669 - Water Supply Piping

H. OSHA and other Safety Requirements

I. Section 01620, 2.03 - Protection Trees, Lawns & Landscaping

1.03 PROTECTION

A. Before beginning any excavation, notify “Blue Stakes,” Sandy City Transportation Division and any affected utility companies. Obtain an excavation permit and provide a traffic control plan to City. All approvals must be in place before starting work.

B. Protect trees, shrubs, lawns, sprinkler systems, and other features to remain.

C. Protect all existing bench marks, structures, fences, mailboxes, sidewalks, paving, and curbs which are to remain from equipment and vehicular traffic.

D. Protect above and below grade utilities which are to remain.

E. Underpin adjacent structures which excavation work may otherwise damage.

F. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

G. Grade perimeter of excavation to prevent surface water run-off from entering into excavation.

H. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

I. Keep groundwater out of excavation. Remove and dispose of groundwater from excavation in a manner that will not cause damage to adjacent areas or facilities.

J. Where soil has been softened or eroded by flooding or placement during unfavorable weather or improper construction techniques, remove all damaged areas and replace according to the requirements of Section 02240.

1.04 CLEARING AND GRUBBING

A. Before commencing the work of this Section, verify with the Engineer all objects to be removed or to be preserved.

B. On-site burning will not be permitted.

C. Use all means necessary to protect existing objects to remain, including benchmarks and monuments. The Contractor will be responsible for all damages to trees, shrubbery, plants, other landscaping and improvements when said damages are a result of his operations. In the case of damage, the Contractor will replace the damaged item(s) in kind. Any item(s) requiring replacement or repair, including, trees and plants, will be warranted by the Contractor for one year.

D. Stockpile or store stripped and grubbed materials as directed by Engineer and do not stockpile or stage materials so as to conflict with contract work, traffic, private property, utilities or any other appurtenances.

E. Grubbing: Remove all surface improvements, stumps, roots, logs, trees, and other vegetation to the outside excavation and fill slope lines, except that where slopes are to be rounded, the areas will extend to the outside limits of slope rounding. Within the limits of clearing, all objectionable material will be removed 3 feet below the existing ground surface or subgrade, whichever is deeper.

F. Remove all debris from the site and leave the site in a neat and orderly condition approved by the Engineer.

G. Use all means necessary to adequately control dust, mud and erosion on and near the work site as per Section 01515 and as shown in the contract documents.

PART 2 PRODUCTS

2.01 MATERIALS

A. Comply with Section 02230.

PART 3 EXECUTION

3.01 GENERAL

A. Notify Engineer 48 hours prior to starting any excavation.

B. Do all excavation of every description and of whatever substances encountered to the depths or grade line as specified in construction documents or required to accomplish the work.

C. Stockpile material suitable for backfilling at a safe location such that no contamination occurs before backfill operations.

D. Promptly remove all other materials from the site and waste in an area provided by the Contractor and approved by the Engineer.

E. Store all excavated materials to cause minimum inconvenience to public travel, and make provisions for urgent traffic as necessary. Provide free access to all fire hydrants, water valves and meters, and leave clearance to enable free flow of storm water in all gutters, conduits, and natural water courses.

F. Use all means necessary to control dust, mud and erosion on and near the work and on and near all off-site borrow areas as per Section 01515.

G. Provide means to prevent surface water from flowing into trenches or other excavations. Promptly remove any water from excavation.

H. Utilize appropriate traffic signs, markers, and procedures in all construction activities as defined in the current MUTCD.

3.02 TRENCH EXCAVATION

A. Excavate trenches for pipes to the lines and grades called for on the drawings despite the type of material encountered.

B. Backfill unauthorized over excavation with material as approved by the Engineer at no expense to the City, as per Section 02230.

C. Grade the bottom of the trenches to provide uniform bearing and support on undisturbed soil or compacted material along the entire length of pipe. Make bellholes and depressions only of such length, depth, and width as required for properly making the particular type of joint.

D. When boring is not possible, perform trench excavation by open cut method. In those areas where utilities are to be installed under existing curbs, gutters and/or sidewalks, at the direction of the City; bore, tunnel, and backfill, or cut and remove the curb, gutter, and/or sidewalk.

Where curb, gutter or sidewalk must be replaced, match the existing structure in line, grade and type of construction at no additional cost to the City.

Use boring or tunneling devices according to the manufacturer=s recommendations.

E. Where material unsuitable for pipe bedding is encountered, notify the Engineer who will direct the extent to which the removal and replacement with suitable select material will be made. Backfill the trench to the proper grade with suitable material as approved by the Engineer, and thoroughly compact in accordance with Section 02240. Use sand bedding within the pipe zone for all ductile iron pipe as per Standard Details SR-01 and PZ-01.

F. Conform with Section 02214 – “Shoring and Bracing Trenches.”

G. Carefully remove all shrubs, fences, and other above ground items; carefully cut and remove all sod with sod cutter if reused. Excavate topsoil for a depth of 12 inches or the depth of the existing topsoil, whichever is less. Remove the sod and topsoil at least two feet wider (one foot each side) than the excavated trench width. Pile the topsoil and sod material separately and do not mix with the remainder of the excavated material.

H. Maximum trench length open at any given time will not exceed 700 feet unless otherwise approved by the Engineer and must be backfilled in a timely manner. An open trench is anything not at finished grade.

3.03 STRUCTURAL EXCAVATION

A. If unsuitable material is encountered at the bottom of the excavation, over excavate as directed by the Engineer and backfill in accordance with Section 02240.

B. If conditions permit, slope excavation sides as excavation progresses to maintain a safe and clean working area, in conformance with OSHA requirements.

C. Support excavations so as to not interfere with the bearing of adjacent foundations.

D. Hand trim excavation and remove loose matter.

E. Correct unauthorized excavation at no cost to the City.

F. Conform with Section 02214 – “Shoring and Bracing.”

3.04 ROADWAY EXCAVATION

A. Completely excavate and install all underground work contemplated in the subgrade before subgrade work is started.

B. In advance of setting line and grade stakes, clear and grub the site and drain all depressions or ruts which contain water.

C. Where the Engineer deems the subgrade material to be unsatisfactory, excavate to such depths as he may direct, and backfill in accordance with Section 02240.

D. Correct excavation in earth beyond the specified lines and grades by filling the resulting voids with approved granular material. Do not proceed with work until the Engineer has approved the material and the proposed method of backfilling for over excavation errors. Repair over excavation caused by negligence of the Contractor at no cost to the City.

E. Stabilize poor load-bearing soils using a geotextile fabric in conformance with Section 02260 and Section 02240, 6.04.

3.05 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces by Engineer.

B. Schedule inspections 48 hours in advance.

C. Do not install reinforcing steel, subbase course, or base course prior to bearing surface inspection.

END OF SECTION

SECTION 02224

CASING PIPE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Casing pipe installation

B. Carrier pipe installation through casing pipe

C. Pressure testing carrier pipe

D. Backfilling

E. Sealing ends of casing pipe

1.02 RELATED WORK

A. Section 02669 - Water Supply Piping

1.03 QUALITY ASSURANCE

A. Comply with federal, state, and local codes and regulations.

B. Materials and workmanship for casing pipe construction shall be in accordance with applicable governing authority.

C. Only workers experienced in jacking or boring operations shall be used in performing the work.

1.04 REFERENCES

A. Union Pacific Railroad Company, Specification C.S. 1029.

B. "A Guide for the Installation of Ductile Iron Pipe", Cast Iron Pipe Research Association.

C. American Society for Testing and Materials (ASTM):
   1. C150, "Portland Cement".

D. American Water Works Association (AWWA):

   1. C210, "Coal-Tar Epoxy Coating System for the Interior and Exterior of Steel Water Pipe".

E. "Standard Specifications for Public Works Construction", Building News, Inc.

PART 2 PRODUCTS

2.01 CASING PIPE

A. Shall be smooth steel pipe in accordance with Union Pacific Specification C.S. 1029 constructed of A-252 Grade B steel.
   1. Minimum yield strength of 35,000 psi.
   2. Required casing wall thickness: Refer to Sandy City Standard Details, Figure 6.
   3. Minimum casing inside diameter: Refer to Sandy City Standard Details, Figure 6.

B. Protective coating.
   1. Pipe exterior surface shall be prepared and then coated with Coal-Tar Epoxy Coating System in accordance with AWWA C210.

2.02 CARRIER PIPE

A. Shall be as specified in Section 02669 - Supply Piping and as shown on the approved plans.

2.03 POLYETHYLENE FOR CARRIER-CASING END SEAL

A. Shall comply with AWWA C-105.

2.04 RESTRAINED CASING SPACERS

A. Shall be Uni-Flange7 Restrained casing spacers or equivalent as approved by the Engineer.

B. Restrainer Body and Runner Supports
   1. Shall be High Strength Ductile Iron, ASTM A536, 65,000 psi tensile strength, 45,000 psi yield strength, 12% elongation capability. (Grade 65-45-12).

C. Connecting Rods/Nuts
   1. Shall be High Strength, Low Alloy ASTM D242, ANSI/AWWA C111/A21.11.

D. Clamping Bolts/Nuts
   1. Shall be SAEJ 429, Grade 5.

E. Runners
   1. Shall be Ultra High Molecular Weight Polymer with a Tensile Impact of 600-1200 Ft.lbs/in^2. Coefficient of friction shall be 0.10 ASTM D-1894 with a Dielectric Constant of 2.3 ASTM D-150. Temperature Range shall be between -2201F to +1,8001F continuous service.

2.05 GROUT

A. Grout for sealing ends of casing pipe and filling voids shall be low pressure grout (less than 10 psi). Neat cement grout shall be used except that large voids shall be filled with pressure concrete or grout containing sand.

2.06 SOIL CEMENT

A. Slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable material for this purpose, as determined by the Engineer, import suitable material at Contractor's expense.

2.07 CASING BACKFILL MATERIAL

A. Shall be in accordance with manufacturers' specifications for type of application and machinery used.

PART 3 EXECUTION

3.01 PREPARATION

A. Obtain all permits required by governing authority for casing pipe installation.
B. Grouting equipment and material shall be on the job site before boring or jacking operations and drilling of grout holes are completed in order that grouting around the outside face of the

casing pipe, if required as specified in article 3.03, may be started immediately after the boring or jacking operations have finished.

3.02 CASING PIPE INSTALLATION

A. The casing pipe shall be installed by jacking or boring. No open cut will be allowed unless approved by the Engineer.

B. The leading section of casing pipe shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the operation. The driving ends of the casing pipe shall be properly protected against spalling and other damage, and intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the jacking stresses.

C. The steel casing shall be installed so as to prevent leakage of any substance into the casing throughout its length when completed. Care shall be exercised so that no damage will occur to utility lines and adjacent facilities.

D. Adequate working space shall be provided at the end from which the boring or jacking is being done for the jacks, bulkheads and starting pipe sections. Provide adequate bulkheads and supports to distribute the jacking pressure evenly around the periphery of the pipe and to the soil for the backstop. As jacking or boring progresses, soil shall be removed from ahead of the open end and removed through the pipe. Care shall be taken to minimize excavating ahead of the casing pipe so that only the soil necessary to allow the pipe to go through is removed, eliminating voids outside the casing pipe as far as possible.

E. The casing pipe shall be accurately aligned during the boring or jacking operation so that the steel casing shall be installed within vertical and horizontal tolerances of 0.5 foot.

F. The joints of sections of casing pipe shall be welded with a continuous circumferential weld.

G. Assure welded joints and casing pipe is covered with protective coating in accordance with AWWA C210.

H. Once the operation has commenced, it shall be continued uninterrupted around the clock until the casing pipe has been installed between the required limits.

I. Upon completion of installation of casing pipe, all voids around the outside face of the casing pipe shall be filled by grouting.

J. Should appreciable loss of ground occur during the installation procedure, the voids shall be backpacked promptly to the extent practicable with soil cement. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

3.03 GROUTING

A. After completion of installation of casing pipe, all known voids around the outside of the casing pipe shall be filled by grouting.

B. Pressure grout through grout pipes installed from the ground surface. At least two grout holes will be required at each location to permit escape of air.

C. Grout shall be placed by means of pumps of positive displacement or pneumatic type and capable of placing grout at pressures up to 100 psi unless otherwise approved by the Engineer. Grout shall be placed at pressures which are requisite for the conditions encountered, and will ordinarily be less than 10 psi except in cases where large cave-ins or other adverse conditions may require higher pressures.

3.04 CARRIER PIPE INSTALLATION

A. The carrier pipes to be installed inside casings shall be installed with self-restraining casing spacers. Casing spacers shall provide axial thrust restraint to prevent pipe joint separation during and after installation. They shall also provide dielectric insulation between the carrier pipe and the casing and facilitate insulation of the carrier pipe into the casing.

B. Restrained casing spacers shall be provided at all pipe bell joints. In addition, casing spacers shall be installed each 10 feet of pipeline to support the pipe barrel and the weight of its contents.

C. The carrier pipe shall be installed and pressure tested in accordance with applicable parts of Section 02669 - WATER SUPPLY PIPING prior to backfilling.

D. Seal ends of casing pipe to carrier pipe with polyethylene to prevent entrance of foreign material.

E. Carrier pipe shall have a valve placed on both ends of casing. Carrier pipe shall be offset five feet to the side of the casing using 451 bends. Valves shall be located at a depth of 48" and on the 5' offset. See Standard Detail Figure 6-1.

F. Carrier pipe joints for a minimum of 80 feet beyond the valves on either side of the casing shall be mechanically restrained with Uni-Flange pipe restraint for ductile iron pipe or approved equal.

END OF SECTION

SECTION 02230

GRANULAR MATERIALS, FLOWABLE FILL, AND TOPSOIL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Granular materials gradation requirements.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. AASHTO T 11 - Sieve Analysis of Fines Passing #200.

C. AASHTO T 19 - Unit Weight and Voids in Aggregate.

D. AASHTO T 27 (ANSI/ASTM C 136) - Sieve Analysis of Fine and Coarse Aggregates.

E. AASHTO T 89 - Determining the Liquid Limit of Soils.

F. AASHTO T 90 - Determining the Plastic Limit and Plasticity Index of Soils.

G. AASHTO T 96 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of The Los Angeles Machine.

H. AASHTO M 145 - The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes.

1.03 SUBMITTALS

A. Submit, for Engineer's approval 48 hours prior to use in the work:

1. A job-mix material gradation and/or material design sheet for Un Treated Base, sand bedding, bituminous pavement, granular borrow, Portland Cement Concrete, flowable fill, native material and other materials as requested by the Engineer.

2. All changes in material design.

1.04 PRODUCT STORAGE AND HANDLING

A. No granular material shall be stockpiled on site unless approved by Engineer.

B. Prevent segregation and change in optimum moisture content of stockpiles.

1.05 ACCEPTANCE

A. Engineer reserves the right to select and test backfill on a random basis from any location in the work, on the site or from the backfill source.

B. Acceptance of aggregates with respect to gradation will be based on compliance with the gradations specified in Part 2 below.

C. Failure of material compliance is cause for rejection.

D. The finished aggregate shall be maintained to line and grade, and at the specified density until covered by an additional course of base or surface course. Any base that becomes soft, wash-boarded or distorted under public or construction traffic shall be scarified, watered, remixed and re-compacted to a firm, smooth surface at the Contractor=s expense.

PART 2: PRODUCTS

2.01 NATIVE MATERIALS

A. Classifications A-1-a of AASHTO M 145.

2.02 SAND BEDDING

Sand Bedding:

Free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the Engineer may be objectionable or deleterious. Graded within the following limits:

Sieve Size	Percent Passing by Weight
3/4 - inch	100
No. 4	80 - 100
No. 10	30 - 50
No. 40	10 - 30
No. 200	0 - 15

2.03 GRANULAR BORROW

Granular borrow shall be angular in shape and conform to the following gradation (4 - inch):

Sieve Size	% Passing
4 - inch	100
3 - inch	70 - 95
2 - inch	60 - 90
1 - inch	40 - 80
No. 40	15 - 60
No. 200	0 - 15

2.04 UNTREATED BASE COURSE

A. Untreated base course shall conform to the following gradation:

	Grading Band Limits		
Sieve Size	Grade 1-1/2 inch	Grade 1 inch	Grade 3/4 inch
2"	-	-	-
1-1/2"	100	-	-
1"	-	100	-
3/4"	81-91	-	100
1/2"	67-77	79-91	-
3/8"	-	-	78-92
No. 4	43-53	49-61	55-67
No. 16	23-29	27-35	28-38
No. 200	6-10	7-11	7-11

Other mix designs may be submitted for approval by the Engineer.

2.05 FLOWABLE FILL

A. Flowable fill shall conform to the following requirements:

1. Portland Cement will be type I or II.

2. Fly ash shall meet requirements of ASTM C-618, Class F and come from a source on the UDOT Materials Quality Assurance List.

3. The course and fine aggregate for flowable fill will be natural sand consisting of mineral aggregate particles. The gradation of this material will be as follows:

Sieve Size	% Passing
3/4	100
200	0-10

4. Composition: The cubic yard of mix will be designed to meet the following requirements:

a. Compressive strength (28 day)	50-150 PSI
b. Minimum Portland Cement	50 LBS./cubic yard
c. Minimum Fly ash	300 LBS./cubic yard
d. Slump	8-10 inches

2.06 TOPSOIL

A. Topsoil shall be fertile, friable, natural loam and will be capable of sustaining vigorous plant growth. It will be free of stone, stumps, clods of hard earth, plants or their roots, sticks and other extraneous matter. The soil will contain no noxious weeds or their seeds. It will not be used for planting operation while in a frozen or muddy condition.

B. Topsoil will be subject to inspection and approval by Engineer.

2.07 STABILIZATION MATERIAL

A. Filter aggregate shall be washed, clean, crushed stone; free from shale, clay, organic material, and manufactured debris, and graded within the following requirements:

Sieve Size	% Passing
2"	100
1-1/2"	10 - 50
3/4"	0 - 25
No. 4	0 - 10
No. 200	0 - 3

2.08 RIP-RAP

A. Rip-Rap: Hard, durable, angular in shape, having at least two fractured faces, and free from cracks, overburden, shale and organic matter. Neither breadth nor thickness of a single stone should be less than 1/3 its length.

1. Rounded stone will not be allowed.

2. The rock shall sustain a loss of not more than 40 percent after 500 revolutions in an abrasion test (Los Angeles machine - ASTM C-535) and will sustain a loss of not more than 10 percent after 12 cycles of freeze thaw (AASHTO test 103 for ledge rock, procedure A).

i. Rock shall have a minimum specific gravity of 2.5, with a mean particle size (D_{50}) of 4". For stream bed and bank installation, the rock will be 12" plus.

Rip-Rap Diameter	Percent Passing
2 D_{50} (8")	100
D_{50} (4")	50
0.5 D_{50} (2")	20
0.125 D_{50} (1/2")	0

2.09 RECYCLED BASE

Recycled base material must conform to the following:

1. Must meet gradation as outlined in paragraph 2.04 (Untreated Base Course) above.

2. Must be free of petroleum products, vegetative matter, slag, cinders, ashes, rubbish and other material that in the opinion of the Engineer may be objectionable or deleterious.

END OF SECTION

SECTION 02240

BACKFILL, COMPACTION, AND EMBANKMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, material, and equipment as required for filling and compacting for structural backfill, trench backfill, and roadway embankment.

B. Furnish all labor, materials, and equipment to control dust, mud, erosion, drainage, and noise during backfilling operations.

C. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02016 - Protecting and Relocating Utilities

C. Section 02220 - Excavation

D. Section 02230 - Materials

E. Section 05000 - Material Testing

F. OSHA and Safety Requirements

G. ASTM D 698: Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using a 5.5-lb Rammer and 12-Inch drop.

H. ASTM D 1557: Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using a 10-lb Rammer and an 18-Inch drop.

1.03 QUALITY ASSURANCE

A. SUBMITTALS: Comply with Section 02230.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect imported backfill materials before, during, and after installation. Protect the installed work and materials of all other trades.

B. Replacements: In the event of contamination of backfill materials immediately make replacement necessary to the approval of the Engineer at no additional cost to the City.

C. Storage of Materials: Do not store construction materials on streets, roads, or highways unless approved by Engineer.

1.05 SITE CONTROL

A. Unfavorable Weather: Do not place, spread, or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content of material is at $\pm$2% of optimum, or as approved by Engineer.

B. Flooding: Provide berms or channels as necessary to prevent flooding or saturation of subgrade. Promptly remove all water collecting in depressions by approved means as necessary.

C. Dewatering: Provide all pumping, build all drains and do all the work necessary to keep the trench and pipes free from water during the progress of the work. In wet trenches, keep a

channel open along the side of the pipe for conducting the water to a sump hole, from which it will be pumped out of the trench. Do not allow water to enter the pipe.

D. Damaged/Unstable Subgrade: Correct soft and yielding spots by drying and re-compacting the material or by removing and disposing of as directed by the Engineer. Replace with a suitable material as per Section 02230. Where soil has been damaged or has become unstable by flooding, placement during unfavorable weather, or by improper construction techniques, repair at no cost to the City.

E. Dust Control: Comply with Section 01515. Use all means necessary to control dust on and near the work and on and near all off-site borrow areas. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, residents, properties, and concurrent performance of other work on the site.

F. Noise Control: Use equipment equipped with adequate noise attenuation devices. Do not cause noise before 7 a.m. or after 7 p.m. without approval from the Engineer. Comply with City Noise Ordinance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Comply with Section 02230.

PART 3 EXECUTION

3.01 GENERAL EXECUTION

A. Before beginning backfilling operations obtain approval from Engineer.

B. Do not place backfill on frozen, snow-covered, or ice-covered ground.

C. Maintain minimum cover of two feet over pipe zone or conduits during construction, or as required by Engineer.

D. Do not backfill around concrete structures until they have attained 75 percent of design strength.

E. Immediately prior to suspension of construction operations for any reason, provide proper and necessary drainage of the work area.

3.02 FIELD QUALITY CONTROL

A. Optimum Soil Density: Unless indicated otherwise.

1. For A-1 Soils: Use the ASTM D 1557 Method D test (Modified Proctor).

2. For all other Soils: Use the ASTM D 698 Method D Test (Standard Proctor).

PART 4 TRENCH BACKFILL

4.01 EXECUTION

A. The pipe zone is defined as that area from six inches below the bottom of the pipe to twelve inches above the top of the pipe.

B. Do not backfill directly upon any structure or pipe.

C. Do not backfill the trench until the installation has been approved by the Engineer.

D. Materials used for backfilling in both the pipe zone and above the pipe zone will conform to Section 02230. Materials will be free from clods of earth debris, decomposable material or

frozen materials. When using native material as backfill that conforms to Section 02230, rocks 4 inches or larger will not be permitted adjacent to the pipe.

E. Materials used in the pipe zone will be as shown in Standard Detail PZ-01.

F. Materials used for backfilling in the pipe zone will be deposited and compacted in layers equal to 1/3 the diameter but not to exceed 8 inches in non-compacted depth. Deposition and compaction of bedding material will be done simultaneously and uniformly on both sides of the pipe.

G. Place material used for backfilling above the pipe zone in layers not to exceed 12 inches in non-compacted depth and compact each layer by means of mechanical tampers or vibratory compactors at +/- 2% optimum moisture content to an average of 96% laboratory maximum density as per method in 3.02 above.

H. Provide density testing in accordance with Section 05000. When flowable fill is used acceptance with relation to strength and slump will be based on the concrete testing procedures as outlined in Section 05000, 3.01.

I. Do not cause the pipe to shift or be damaged by the compaction operation.

J. When backfilling do not allow sharp, heavy pieces of material to drop directly onto the pipe or the tamped material around the pipe. Do not use backfill material of consolidated masses larger than 1/2 cubic foot.

K. Flowable fill conforming to Section 02230, 2.05, shall be required for backfill on all trenches less than or equal to 24 inches wide, for all trenches backfilled between October 15 and April 15, and for backfilling tunnels unless approved by Engineer.

PART 5 STRUCTURAL BACKFILL

5.01 EXECUTION

A. Backfill areas to contours and elevations as shown on the plans.

B. Do not use compaction equipment adjacent to walls or retaining walls that may cause the wall to become over stressed or moved from final alignment. Do not backfill against walls until concrete has obtained 75% of design strength.

C. Compact backfill in lifts not to exceed $\pm$2% optimum moisture content to an average of 96% of laboratory maximum density to subgrade elevation.

D. If tests indicate work does not meet specified compaction requirements, remove work, replace and retest at no cost to the city.

E. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported structural walls where possible.

F. Make smooth changes in grade. Blend slopes into level areas.

G. Remove surplus backfill materials from site.

5.02 REPAIR OF DAMAGED STRUCTURES

A. Restore any damaged structure to its original strength or condition and backfill to specifications.

5.03 SCHEDULE OF LOCATIONS

A. Paragraphs 1-3 below identify location, fill material to be used (identified from lower to upper fill type), a compacted thickness of each fill, and compaction expressed as a percentage of maximum density and optimum moisture in comparison with Section 02240, Part 3, for testing each lift.

1. Under Footings: Compact 3/4" maximum untreated base course in six inch lifts to 98 percent maximum density.

2. Box Culverts and Retaining Walls: Native or granular borrow fill to subgrade elevation, each six inch lift compacted to 96 percent of maximum density.

3. Miscellaneous Structures: Backfill with granular borrow in six inch lifts compacted to 96 percent of maximum density.

PART 6 ROADWAY EMBANKMENT

6.01 PREPARATION

A. Mixing and Placing: Uniformly shape the subgrade prior to placing geotextile fabric, subbase course, and/or untreated base course and, after all earthwork is substantially completed and all drains are laid, bring subgrade to the lines and grades as shown on the plans. Compact subgrade to an average of 96% of maximum laboratory density as per method in 3.02 of this section.

B. Notify Engineer 48 hours prior to placing untreated base course for subgrade inspection.

C. Correct soft and yielding spots as per 1.05, D, of this Section. For poor load bearing soil comply with 6.04 of this section.

D. Once prepared, maintain subgrade in a satisfactory condition until the geotextile fabric and/or untreated base course have been placed. Repair all cuts, ruts, and breaks in the surface of the subgrade at the contractor's expense. Protect the prepared subgrade from damage resulting from contractor=s operations and public traffic.

E. Maximum of 12 inch lifts compacted to 96% density.

6.02 SPREADING

A. Once subgrade has been accepted by the City, deliver imported aggregate bases to the roadbed as uniform mixtures and spread each layer in one operation. Avoid segregation and keep the base free from pockets of coarse or fine material.

B. Deposit aggregate bases on the roadbed at a uniform quantity per linear foot which will provide the required compacted thickness. Maintain a moisture content throughout the material sufficient to obtain the required compaction.

C. Install eight (8) inches minimum untreated base course for roadways whose right-of-way is sixty-eight (68) feet or less; a depth of twelve (12) inches on roadways whose right-of-way is greater than sixty-eight (68) feet; a depth of twelve (12) inches on roadways West of I-15 or in areas where roadbed contains clay; or as otherwise specified on drawings and/or specifications. (See notes on Standard Details SR-01 and TS-01.)

1. Place 4-inches minimum untreated base course under sidewalks, as per Standard Detail CD-02.

2. Place 6-inches minimum untreated base course under curb and gutter, as per Standard Detail CG-01.

D. Where the required thickness is eight inches or less, spread and compact the base material in one layer. Where the required thickness is more than eight inches, spread and compact the base material in two or more layers of approximately equal thickness, with a maximum compacted thickness of any one layer not exceeding eight inches.

6.03 ROADWAY COMPACTION AND TESTING

A. Commence compaction along the edge of the area to be compacted and gradually advance toward the center.

B. Operate compaction equipment along lines parallel or concentric with the center line of the road being constructed.

C. Do not vary the surface of the finished aggregate base more than 3/8 inch in 10 feet in any direction.

D. Correct any profile deviation greater than 3/8 inch. Rework minimum of 4inch lift to achieve homogeneous density.

E. Compact untreated base course in roadway and under curb, gutter, and sidewalk at ±2% optimum moisture content to an average of 96% maximum laboratory density.

F. Comply with all requirements in Division 5.

6.04 POOR LOAD-BEARING SOIL

A. Stabilize poor load-bearing soils using a geotextile fabric in conformance with Section 02260 as follows, installed in strict accordance with the manufacturer=s recommendations and the following additional requirements:

1. Remove all organic material from the subgrade and grade to elevation shown on plans.

2. Compact subgrade to the extent allowed by the condition of the substrate. This will be determined by the Engineer. Areas showing movement by the deflection test using a loaded 10-wheel truck shall be either removed and replaced with structural fill material meeting Section 02230, or reworked as per Section 02230, 1.05D until area no longer shows movement under the deflection test.

3. Upon completion of subgrade preparation and upon approval of the Engineer, the fabric will be rolled out to the limits in conformance with the drawings. Fabric should be as smooth as possible, free from large wrinkles or folds etc.

4. Overlap the fabric at joints with a minimum of 1.5 feet. In the direction of the spreading operations, the overlap at the end of a roll or at a cut shall be overlapped above the start of a new roll.

5. Dumping traffic will be maintained at an absolute minimum and drivers will be instructed to stagger their tire tracks to minimize subgrade and fabric disturbance.

6. Repair any puncture by covering new fabric using the same overlap dimensions as shown in Paragraph 6.04, A, item 4 above.

7. Cover fabric with 12 inches of sand before placing rock larger than 4" diameter on top of fabric.

8. Aggregate base or select granular fill materials over fabric will be placed full depth at twelve (12) inches in uncompacted thickness. Following compaction, subsequent lifts will be placed as required and will not exceed twelve (12) inches in uncompacted thickness. Lifts near the minimum thickness will be placed to minimize construction traffic.

9. Compact imported material as required on the plans or to 96% compaction as measured by AASHTO T - 180.

10. If required to facilitate compaction, only the minimum amounts of water will be added to the material to provide efficient compaction. **In no case, will the fill material be placed or compacted at a moisture content exceeding the optimum as determined by the test method specified above.**

11. Compaction to the specified degree will be accomplished utilizing steel drum rollers, preferably static. If the Contractor utilizes vibratory compaction methods, the procedure will be closely monitored to assure that the procedure does not enhance moisture infiltration from the subgrade or fill materials, i.e., pumping etc. Should

detrimental conditions begin to appear, the use of vibratory equipment will be immediately discontinued.

B. All of the Contractor=s fabric stabilization operations beginning with review of the cleared, grubbed, and excavated subgrade and continuing through final placement, grading and compaction of any and all fill material will be continuously observed and/or tested for compliance with these specifications.

C. Stabilization fabric under a minimum of 12 inches of untreated base course and 4 2 inches of asphalt will be used in all roadway construction west of I-15 and in all areas of clay throughout the City. The only exception will be for development areas where sufficient geotechnical data shows the absence of clay or structurally substandard material and/or the pavement design exceeds the required minimum thickness. The Engineer will review requests to vary from the above requirements.

6.05 WORK ON STATE ROADS

A. Conform to UDOT standards, obtain permits from UDOT and pay all fees.

END OF SECTION

SECTION 02260

ENGINEERING GEOTEXTILE FABRICS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials and equipment required to stabilize poor load-bearing soils.

B. Furnish all labor, materials and equipment required to install subsurface drainage system.

C. Furnish all labor, materials and equipment required to overlay road surfaces.

D. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02220 - Excavation

C. Section 02240 - Backfill, Compaction, and Embankment

D. Section 02410 - Subdrainage Systems

E. Section 02503 - Bituminous Paving Course

F. Section 02513 - Bituminous Concrete Paving Materials

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver geotextile fabric in original wrapping showing name of manufacturer and product weight.

B. Store in accordance with manufacturer's recommendations and in a location that will keep fabric from damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Paving Geotextiles - The fabric shall be specifically designed for hot mix asphalt pavement. It shall be heat bonded only on one side to assist in preventing bleed through of tack coat and sticking of fibers to wheels of lay-down equipment.

1. Nonwoven Fabric: This fabric shall be non - woven consisting of synthetic fibers bonded to provide a strong, water permeable material. It shall meet the minimum requirements listed in Table 1 below when tested in accordance with the applicable ASTM tests.

TABLE 1

Fabric Weight	4.0 oz/sq yd
Grab Strength	115 lbs.
Grab Elongation	50%
UV Resistance	70 %
Melting Point	>300 deg. F
Asphalt Retention	0.20 gal./sq yd

B. Stabilization Geotextiles

1. Woven Fabric: This fabric shall consist of synthetic fibers woven to provide a strong, water permeable material. It shall meet the minimum requirements listed in Table 2 below when tested in conformance with the applicable ASTM test.

TABLE 2

Grab Strength	270 lbs.
Grab Elongation	< 50%
Trapezoidal Tear	100 lbs.
Puncture Strength	100 lbs.
Water Flow Rate	2 gal./min/ft^2
Apparent Opening Size	> or = 30(U.S. Sieve)
UV Resistance	70%

C. Subsurface Drainage Geotextiles

1. Non-woven Fabric. This fabric shall be non-woven consisting of synthetic fibers bonded to provide a strong, water permeable material. It shall meet the minimum requirements listed in Table 3 below when tested in accordance with the applicable ASTM tests.

TABLE 3

Grab Strength	200 lbs.
Grab Elongation	>50%
Trapezoid Tear Strength	50 lbs.
Puncture Strength	60 lbs.
Mullen Burst Strength	300 PSI
Apparent Opening Size	> or = 60(U.S. Sieve)
Coef. of Normal Permeability - k.	k > k of soil
Flux gal./min./sq. ft.	25

D. All other uses of geotextiles shall be of type and specification as approved by Engineer.

PART 3 EXECUTION

3.01 SUBSURFACE DRAINAGE

A. Refer to Section 02410, 3.01.I.

3.02 STABILIZING POOR LOAD-BEARING SOILS AND STABILIZATION FABRIC INSTALLATION

A. Refer to Section 02240, 6.04.

3.03 REPAIR OF ASPHALT CONCRETE ROAD SURFACES AND PAVING FABRIC INSTALLATION

A. Refer to Section 02503, 3.03 for installation procedures.

END OF SECTION

SECTION 02271

RIPRAP

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to furnish and place loose riprap, hand-placed riprap, or grouted riprap at the locations and in conformity with the lines and grades as shown on the plans or as directed by the Engineer.

1.02 QUALITY ASSURANCE

A. Submit riprap source, gradation, and placement technique to Engineer for approval prior to placement.

B. Prior to beginning placement, obtain Engineer's approval of the grading of the area requiring riprap.

PART 2 PRODUCTS

2.01 RIPRAP MATERIALS

A. Refer to Section 02230, 2.08 for details.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove all brush, trees, stumps, and other objectionable materials as directed by Engineer and dress area to a reasonably smooth surface. Make excavation at the toe of the slope as shown on the plans or as directed by the Engineer to provide a firm foundation and protection against undercutting.

3.02 PLACEMENT OF LOOSE-PLACED RIPRAP

A. Dump stones into place so as to secure a rock mass with minimum thickness and height as specified, but in no case less than one (1) foot in thickness. Manipulate rock to secure a uniform, stable surface of graded sizes and mass stability.

3.03 PLACEMENT OF HAND-PLACED RIPRAP

A. Secure a firm foundation.

B. Embed riprap below the ground surface as shown on the plans.

C. Hand place and bed the rocks, one against the other, and as far as practicable, key together. Fill any large irregularities between the stones with spalls of suitable size rammed tightly into place.

D. Finished Surface: Place so that the finished surface of the riprap is an even, tight surface, true to the lines, grades, and sections specified.

3.02 PLACEMENT OF GROUTED RIPRAP

A. Place riprap as indicated.

B. After wetting the stones, sweep sand or fine gravel into the interstices to fill to within four (4) inches of the outer surface of the riprap.

C. Fill the remaining volume of the interstices flush with a well-mixed grout.

D. Keep grout wet by sprinkling or covering with wet material for at least three (3) days. Protect grout from stream water or any other disturbance during cure period.

E. Do not place grout in freezing weather.

END OF SECTION

SECTION 02410

SUBDRAINAGE SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials and equipment as required for the installation of all foundation and underslab drainage systems, complete with required couplings and accessories, aggregate bedding and cover, and filter fabric, as shown on the plans.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02220 - Excavation

C. Section 02230 - Materials

D. Section 02240 - Backfill, Compaction, and Embankment

E. Section 02260 - Engineering Geotextile Fabrics

F. Section 03400 - Storm Drain Manholes

G. ASTM D 2321 - Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe (Polyethylene Pipe)

PART 2 PRODUCTS

2.01 MATERIALS

A. Perforated Polyethylene Pipe: Installed as required by ASTM D 2321 and as recommended by manufacturer.

B. Filter Aggregate: Refer to Section 02230, 2.07.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wherever necessary, sheeting, bracing, or cribbing shall be provided and installed by the contractor.

B. Install foundation and underslab drainage system with stabilization material as shown on the plans. Ensure that aggregate is free of contamination from fine-grained soils. Refer to Section 02230, 2.07.

C. Hand trim excavations to required elevations. Do not over excavate. Remove large stones or other hard matter which could damage drainage pipe.

D. Place drainage pipe on a minimum of six (6) inch deep bed of stabilization material as shown on the plans.

E. Lay drainage pipe on grade shown, with maximum variations of 1/8 inch in ten feet.

F. Ensure complete connection to storm water system using solid pipe as shown on the plans.

G. Prior to placing filter aggregate cover, allow Engineer to make visual inspection of installed drainage pipe and connections.

H. Place stabilization material in maximum one (1) foot lifts, consolidating each lift within the pipe zone. Do not displace or damage drainage pipe when backfilling or compacting.

I. The Contractor shall install the subsurface drainage geotextile fabric to the lines and grade indicated. Fabric installation shall be in strict conformance with the manufacturer's recommendation except as modified below:

1. Where lapping of the fabric is required, the lap distance will be a minimum of eighteen (18) inches. Laps placed in the trench or along the blanket drain area will be made such that the overlying fabric edge is down slope from the direction of flow.

2. Repair any punctures with a patch of fabric overlapping the puncture at least one (1) foot in all directions of the hole.

3. Lay fabric in a manor so as to minimize the number of seems.

3.02 BACKFILL

A. Following completion of the installation, as specified herein, the under-drain will be backfilled, as specified in Section 02240.

B. Where under-drains discharge onto fill or cut slope subgrade, the discharge area will be protected against erosion by the placement of riprap, cobbles or other approved materials. The extent of the cover will be shown on the plans or indicated by the Engineer.

END OF SECTION

SECTION 02433

NON-PRESSURE PIPE INSTALLATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, equipment and materials required to install pipe.

B. Dispose of unsuitable materials.

C. Perform trench backfilling and compaction in conformance with Section 02240.

D. Perform trench pavement restorations in conformance with Sections 02503 and 02575.

E. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02214 - Shoring and Bracing Trenches

C. Section 02220 - Excavation

D. Section 02230 - Materials

E. Section 02240 - Backfill, Compaction, and Embankment

F. Section 02669 - Water Supply Piping

G. Pipe Zone Standards: City Standard Details (PZ-01).

H. ASTM D 1248 - Standard Specification for Polyethylene Plastic Molding and Extrusion Materials

I. ASTM D 1598 - Test for Time to Failure of Plastic Pipe Under Constant Internal Pressure

J. ASTM D 1599 - Test for Short Term Rupture Strength of Plastic Pipe, Tubing, and Fittings

K. ASTM D 2239 - Specification for Polyethylene (PE) Plastic Pipe (SDR-PR)

L. NSF #14 (National Sanitation Foundation) Standard for Thermoplastic Materials, Pipe, Fittings, Valves, Traps, and Joining Materials

M. AWWA C800 - Standard for Threads for Underground Service Line Fittings

N. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 2 in. Through 3 in., for Water

O. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

P. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

Q. ASTM C 506 - Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe

R. ASTM C 507 - Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe

S. ASTM C 655 - Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe

1.03 JOB CONDITIONS

A. Pipeline lengths indicated on drawings are for information only. Furnish pipeline lengths as required to complete the project.

B. Perform no pipe work in areas receiving fill until embankment or fill has been completed to at least two feet above the top of the pipe grade and has been properly compacted and accepted.

C. Street/Highway Right-of-Way: Install pipe within State, County, and City highway rights-of-way where required as shown on plans. Obtain and secure all required permits and bonds and pay all fees.

1.04 DEFINITIONS

A. "Rigid Pipe" is all concrete pipe, steel pipe, and ductile iron pipe.

B. "Flexible Pipe" is all thermoplastic pipe such as PVC, PE and ABS Composite.

C. "Pipe Zone" is the area six inches under the pipe, the sides of the pipe, the trench width, and twelve inches over the pipe.

1.05 QUALITY ASSURANCE

A. Reject any pipe which does not conform to specifications, or is cracked, chipped, or otherwise unacceptable, including any defects to the internal lining, if applicable.

B. Use the type, size, and strength rating of pipe as specified in the contract documents or as shown on the plans.

1.06 SUBMITTALS

A. Certificates: Submit manufacturer=s certificate of compliance that all material furnished complies with specifications, standard references and contract requirements.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect pipe and appurtenances against dirt and damage during shipment and storage. Store in strict conformance with the manufacturer=s recommendations.

B. Handle and store pipe to prevent damage by crushing, chipping, cracking or piercing and in such a way as to prevent contamination.

C. Do not store polyethylene plastic pipe in direct sunlight for more than 30 days.

PART 2 PRODUCTS

2.01 MATERIALS

A. Furnish pipe of the size, material, and class as shown on the plans or as approved by the Engineer.

B. Pipe Zone Backfill: Comply with Section 02240. When aggregate is approved by the Engineer, no rock larger than four (4) inches will be placed adjacent to pipe.

C. For Trench Stabilization: Comply with Section 02230, 2.07.

2.02 REINFORCED CONCRETE PIPE

A. Use Class III Reinforced Concrete Pipe. For storm drain systems under any traffic traveled areas, pipe material shall be Reinforced Concrete Pipe only.

B. Use pipe for storm sewers that use rubber gasketed bell and spigot type joints conforming to ASTM C 443. For elliptical pipe sections use tongue and groove joints. Flowable Fill is required for concrete elliptical pipe up to the top of the pipe.

C. Use 15 inch minimum diameter in the Right of Way unless approved by Engineer.

2.03 POLYETHYLENE PIPE

A. Use polyethylene pipe that conforms to the requirements of ASTM D 1248 entitled “Standard Specification for Polyethylene Plastic Molding and Extrusion Materials.”

1. Use ADS N12 or approved equal.

2. Provide water tight couplers that will withstand a minimum of 10.8 psi.

PART 3 EXECUTION

3.01 INSPECTION

A. Comply with Section 05000.

3.02 PREPARATION

A. Verify location of existing utilities and structures ahead of pipe laying operation. If pipe adjustment is necessary due to location of other utilities, obtain written approval from Public Utilities prior to proceeding

B. Note all deviations from plans previously approved by the Engineer and file with project records, document notes of all adjustments.

3.03 DEWATERING

A. Keep the pipe trench free from water during pipe installation by a method acceptable to the City Engineer.

B. The contractor shall be responsible for all damages of any nature resulting from the dewatering operations.

C. Dewatering of the trenches is considered incidental to the construction. Include all associated costs for trench dewatering in the lump sum contract price.

3.04 TRENCH SHORING

A. Provide trench shoring as required by section 02214.

3.05 PIPE INSTALLATION GENERAL

A. Class III reinforced concrete pipe shall be used within Sandy City rights-of-way and within any private or public roadway parking lot, or area traveled by traffic.

B. Use of polyethylene plastic pipe within City right-of-way is not permitted unless approved by Public Utilities and the City Engineer.

C. Install pipe as per manufacturer=s specific instructions. Do not install pipe without continuous support under the barrel or where a dry joint connection cannot be made.

D. Use the same pipe cross-section, pipe material, and slope when extending existing piping systems.

E. Lay pipelines on uniform grades between manhole inverts, unless otherwise shown on the plans.

F. Do not install pipe at a grade less than 0.5%.

G. Lay gravity flow pipe upgrade beginning at lower end.

H. Handle pipe in accordance with manufacturer's recommendations.

I. Do not lay pipe in water.

J. Do not lay pipe when trench conditions or weather is unsuitable for such work.

K. Remove any section of pipe already placed which is out of alignment, defective, or damaged. Relay or replace without additional cost to the City.

L. Place elliptical concrete pipe which contains elliptical reinforcing so that the reference lines designating the top of the pipes will not be more than five degrees from the vertical plane through the longitudinal axis of the pipe.

M. Use an approved machine or cutting tool as recommended by the pipe manufacturer to cut pipe.

N. Secure Engineer's approval to deflect pipe from true line and grade. Do not exceed deflection allowed by pipe manufacturer's recommendation.

O. Secure plugs for pipeline branches, stubs, or other open ends which are not to be immediately connected. Use a joint comparable to the main line joints and thrust block as required to secure plug.

P. Join pipe in accordance with manufacturer's recommendation or as specified in piping specifications section.

Q. Do not exceed 300 feet of continuous pipe placement without the installation of an inlet box, catch basin, combination box, cleanout box manhole, or other such structure.

R. Where the pipe is specially coated for protection against corrosion, take care that the coating is not damaged. Repair any damaged areas or remove and replace the pipe section as directed by the Public Utilities Inspector.

S. Provide proper equipment for lowering sections of pipe into trenches.

T. Provide dust control during cutting of pipe.

U. Structures:

1. Concrete Work: Conform to Section 03300.

2. Form, size, and brace so finished structure conforms to details indicated and Section 03100.

3. Mortar joints at catch basins, clean-outs, manholes etc., as per Section 03350.

V. Closure Collars:

1. Use closure collars to make connections between pipeline and concrete structure, dissimilar pipe or where standard pipeline joints are impractical.

2. Remove all loose material and soil from the surface on which concrete shall be placed. Non-metallic pipe will be thoroughly wetted prior to pouring the collars.

3. Ensure that concrete is placed in one continuous placement and extends a minimum of 12 inches on each side of the joint and continuous all around the pipe.

4. Do not pour collar with wasted concrete or bag mix. Make sure soil in pour area is well moistened earth.

W. After installation is completed, all pipes shall be recorded, with closed circuit television (CCTV) or similar recording device, and a copy submitted to Sandy City Public Utilities. Any Pipe section or joint not in compliance with Sandy City Standards Specifications shall be replaced or repaired to the satisfaction of the Sandy City Public Utilities Inspector at no additional cost to the City.

3.06 PIPE BEDDING

A. Unless otherwise specified on the plans, in the bid schedule, or in the special conditions and addenda, all pipe shall be bedded with six (6) inches minimum sand, and shall conform to the following bedding types as per Standard Detail PZ-01:

1. Rigid Non Pressure Pipe: Type I.

2. Flexible Non Pressure Pipe: Type II.

3. Flexible or Rigid Pressure Pipe: Comply with Section 02669.

B. Excavate with straight cutting edge to minimize soil disturbance. Make bellholes and depressions only of such length, depth, and width as required for properly making the particular type of joint.

C. Repair unstable subgrades for pipe installation by over-excavating to stable soils or a minimum eight inches depth and replace with approved stabilization material. Refer to Section 02220, 3.02E.

D. Follow Section 02240, part 4 to compact trench up to subgrade in 8-inch lifts to minimum of 96 percent of laboratory maximum density as per method in Section 02240, 3.02.

3.07 PRESSURE PIPE INSTALLATION

A. Refer to Section 02669, 3.03

3.08 LANDSCAPE IRRIGATION PIPE

A. Refer to Division 7.

END OF SECTION

SECTION 02438

STRUCTURES TO FINISH GRADE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, and equipment as required for raising or lowering of sewer manholes, rings and covers; storm drain manholes, rings and covers; valve boxes, catch basins, monument frames and covers, or other miscellaneous structures to the final grades shown on the plans or as directed by the Engineer.

B. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 03350 - Catch Basins and Inlets

C. Section 03400 - Storm Drain Manholes

D. Section 03000 - Concrete Work

E. Manual on Uniform Traffic Control Devices (MUTCD)

F. OSHA - Confined Space Entry Regulations

G. Standard Detail FG-01

PART 2 PRODUCTS

2.01 CONCRETE

A. Use 3650 psi concrete for all required concrete work as noted in Section 03000 and as per standard detail FG-01. Bag mix concrete shall not be allowed.

1. Sanitary Sewer Manhole, Culinary Water Valve Box Collars, PRV and Air Vac Boxes, and Survey Monuments are to be circular in shape and centered.

2. Storm Drain Manhole Collars are to be square in shape and centered with the direction of flow etched or scored in concrete collar surface.

3. Oil/Water Separator Manhole Collars and Water Meter Vault Collars are to be square in shape.

2.02 CONCRETE BONDING AGENT

A. Sikadur Hi-Mod Epoxy Adhesive as manufactured by SIKA Chemical Corporation or approved equal shall be used for bonding new concrete to old.

2.03 MANHOLE GRADE RINGS

A. Use precast concrete grade rings for raising manholes.

2.04 ASPHALTIC CONCRETE

A. Upon written authorization of the Engineer, Asphaltic Concrete may be substituted for concrete on streets with right of way widths less than 80 feet. A specification shall be submitted for approval by the Engineer.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to starting construction, check all valve boxes, manholes, and other miscellaneous structures to determine condition. Report any existing broken or damaged valve boxes, manholes, etc. to the Engineer. Any items not reported broken prior to construction will be considered unbroken and must be replaced at no cost to the City.

B. Arrange with all non-City utility companies to have them adjust their manholes, valve boxes, lines, or other required items.

C. Comply with current OSHA Confined Space Entry Regulations.

3.02 ADJUSTING VALVE BOXES

A. Replace broken valve boxes with new boxes conforming to Section 02669, 2.05.

B. Adjust boxes up or down as required to meet new grade.

C. In paved streets raise or lower the valve boxes after paving. Cut a circular area around the valve with a pneumatic spade approximately twelve (12) inches out from the box and concentric with the box. Raise or lower the box to 1/8 inch below the level of the surface and compact the soil around the box to 96 percent, as per 02240, 3.02. Place concrete around the box at least twelve (12) inches deep and transition from new existing grade down 1/8 to 3/8 inch below the pavement surface.

3.03 ADJUSTING MANHOLES TO GRADE

A. Replace broken cones, rings, frames, and/or lids with new materials conforming to the requirements of Section 03400.

B. Raise manholes to grade by using concrete grade rings. Grout grade rings and manhole ring into place; adjust as required to 1/8 inch below surfacing. If the manhole grade is to be raised more than one foot, remove the manhole cone and add barrel sections and grade rings as required. If the manhole is to be lowered, remove the cone and replace with a lower height cone or remove a barrel section as required. Adjust to final grade using grade rings. Do not break cone to lower grade unless approved by the Engineer.

C. Provide invert cover over pipes in the manholes so that no gravel, concrete, or debris can enter the lines.

D. When manhole grades are raised in paved areas, adjust by using grade rings so that the manhole is 1/8 to 3/8 inch below the surface. Remove the paving around the manhole with a pneumatic spade in a circle or square shape, as per 2.01 of this Section, concentric with the manhole, and replace with eight inch thick concrete with a finished smooth transition from new pavement surfacing to top surface of the manhole cover.

3.04 ADJUSTING CATCH BASINS AND MISCELLANEOUS CONCRETE STRUCTURES

A. Remove the existing frame from the structure by removal of concrete as required. Do not damage concrete that is to remain.

B. Clean the concrete surface, coat with epoxy, and reset the seat to the required elevation.

C. Replace broken, damaged, or hazardous frames or grates as directed by the Engineer.

3.05 ADJUSTING MONUMENT FRAME AND COVER

A. Perform work so that the monument is not disturbed or left unprotected during construction. If disturbed, notify Engineer. Refer to Section 02447.

B. Remove the existing frame by cutting the surface with a pneumatic spade in a circle approximately six inches out from the frame.

C. Adjust the frame to 1/8 to 3/8 inch below the pavement surface and concrete into place. Keep concrete from touching monument during placement. See Standard Detail FG-01.

END OF SECTION

SECTION 02447

MONUMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Obtain a Monument Preservation Permit from the office of the Salt Lake County Surveyor in person or on line (**http://surveyor.slco.org/**). Fees may be paid in person or on line as well.

B. Follow the procedure outlined in the Permit.

C. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Follow the procedure outlined by the Salt Lake County Surveyor's Office Monument Permit. All work must comply with the requirements of the Permit.

1.03 REGULATORY REQUIREMENTS

A. Follow the procedure outlined by the Salt Lake County Surveyor's Office Monument Permit. All work must comply with the requirements of the Permit.

1.04 QUALITY ASSURANCE

A. All Monument installation or replacement work must be performed under the direct supervision of a Professional Land Surveyor duly licensed by the State of Utah.

B. Codes and Standard: Comply with all pertinent codes and regulations of State, County and City regulatory agencies.

PART 2 PRODUCTS

2.01 CONCRETE

A. In accordance with Section 03300.

2.02 MARKER PLATES

A. Comply with the requirements of the Salt Lake County Standard Surveyor's Office Monument Permit.

2.03 FRAME AND COVER

A. Comply with the requirements of the Salt Lake County Standard Surveyor's Office Monument Permit.

2.04 OTHER MATERIALS

A. Comply with the requirements of the Salt Lake County Standard Surveyor's Office Monument Permit. Select all other materials not specifically described but required for proper completion of the Work of the Section subject to the approval of the Engineer.

PART 3 EXECUTION

3.01 MONUMENTS

A. Comply with the requirements of the Salt Lake County Standard Surveyor's Office Monument Permit.

B. Frame and cover are not required in non-paved surfaces.

3.02 EXECUTION

A. Follow the procedure outlined by the Salt Lake County Standard Surveyor's Office Monument Permit. All work must comply with the requirements of the Permit.

3.03 PRECISION OF RECONSTRUCTION

A. Follow the procedure outlined by the Salt Lake County Standard Surveyor's Office Monument Permit. All work must comply with the requirements of the Permit. The Salt Lake County Surveyor shall determine if accuracy requirements have been met.

3.04 COMPACTION OF BACKFILL

A. The backfill under and around the monument will be as required by the Salt Lake County Surveyor's Office Monument Permit.

END OF SECTION

SECTION 02503

BITUMINOUS PAVING COURSE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to mix, place, and compact a plant mix bituminous surface course.

B. Prepare base course and compact prior to placing surface course.

C. Prepare existing surfaces to be overlayed and install tack coat. Install geotextile paving fabric prior to placing surface course if required.

D. Obtain permit and provide traffic control as required.

E. Comply with requirements of Section 01041.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02260 - Engineering Geotextile Fabric

C. Section 02505 - Bituminous Tack Coat

D. Section 02513 - Bituminous Concrete Paving Materials

E. Section 05000 - Material Testing

F. ASTM D 2170 - Kinematic Viscosity of Asphalts (Bitumens)

G. ASTM D 2950 - Density of Bituminous Concrete in Place by Nuclear Method.

1.03 SUBMITTALS

A. As required by Section 02513.

PART 2 PRODUCTS

2.01 BITUMINOUS MATERIAL

A. Use the bituminous material as required on the plans in conformance with the requirements of Section 02513.

B. If the source of asphalt changes during the course of the work, submit a new mix design.

C. Do not intermix the asphalt from two different sources or gradations.

2.02 MINERAL AGGREGATE

A. Unless otherwise specifically designated on the plans or in the special provisions, use imported natural gravel, crushed gravel, crushed rock, or crushed slag conforming to the requirements of Section 02513 at the specified gradation.

2.03 TACK COAT

A. Furnish and apply a tack coat in conformance with the requirements of Section 02505.

2.04 TEMPERATURE CONTROL

A. Complete compaction operations before the temperature of the bituminous mixture drops below 220^{o} F.

PART 3 EXECUTION

3.01 MIXING

A. Use a mixing system that will supply bituminous paving materials in conformance with Section 02513. Supply materials that are of the proper temperature, gradation, and mix consistency as defined in the Marshall Mix design.

B. Adjust the production of the mixing plant and material delivery so that a continuous uninterrupted forward paving speed operation is obtained.

3.02 PREPARATION

A. Locate, reference, and protect all utility covers, monuments, curb and gutters, and other structures in place prior to paving.

B. Provide 48 hours written notice to residents and businesses as outlined in Section 01041, 3.04.

C. For overlay process, clean road surface of debris, dust and gravel utilizing vacuum type equipment. Remove all water from surface and allow to dry.

D. Apply a water soluble herbicide for removal of all vegetation within the paving limits, Monsanto Roundup or approved equal.

1. Apply herbicide a minimum of seven days prior to paving operations. Coordinate directly with Engineer.

2. Apply herbicide solution with a shield applicator that directs the solution onto the desired vegetation while shielding adjacent property and improvements.

3. Replace any adjacent property or improvements damaged through this operation.

E. Patch holes and level any uneven areas as identified 24 hours prior to placing surface course.

F. Allow all adjacent concrete to cure for either seven days or until 75% of specified strength (f'c) is obtained prior to beginning paving operations.

3.03 PAVING FABRIC INSTALLATION (WHEN REQUIRED)

A. Geotextile paving fabric shall comply with specifications as outlined in Section 02260.

B. Apply the type and amount of asphaltic sealant specified by the manufacturer or as approved by the Engineer. Apply sealant 6" beyond the area covered by the fabric to insure adequate coverage.

C. Place fabric on substrate with no wrinkles. Cut fabric and overlap on curved roadways to prevent wrinkles as per manufacturer recommendation. Place fabric while asphaltic sealant is still tacky. Place correct surface of fabric against sealant. Meet all placement standards recommended by manufacturer.

D. Broom fabric to increase contact with asphaltic sealant.

E. Overlap fabric at seams six (6) inches minimum. Overlap ends in "shingle" fashion in direction of overlay to insure the end does not pick up.

F. Place overlay on fabric immediately after lay down and brooming.

G. Apply extra sealant at each fabric overlap area to seal joints.

H. Blot fabric with sand where sealant may have penetrated before laying down the overlay to insure that the overlay machine or delivery equipment do not pick up the fabric.

I. Use care in turning, stopping and starting equipment to insure that the fabric is not twisted or wrinkled.

J. Repair tears or wrinkles by cutting and patching as specified in 3.03.E above.

K. Place fabric 18 inches from lip of curb with a minimum depth of 1-1/2 inches of bituminous mix.

3.04 SPREADING AND COMPACTION

A. Maintain the temperature of the bituminous mixture in the lay down operation at not more than 310 ^{o} F. and not less than the value shown in the following chart.

MINIMUM LAY DOWN TEMPERATURE CHART (Fahrenheit)					
	Compacted Paving Mat Thickness				
Ambient Air Temperature	**3/4"**	**1"**	**1-1/2"**	**2"**	3"
45-49					280
50-59				280	270
60-69			285	275	265
70-79		285	280	270	265
80-89	280	275	270	265	260
90+	275	270	265	260	255

B. Do not place asphalt when the ambient air temperature is below that allowed in the table for the given mat thickness and when frozen materials are present in the base or sub-base.

C. Spread the bituminous mixture with self-propelled mechanical spreading and finishing equipment capable of spreading the mixture to the proper grade, thickness, and typical section as specified in the plans or as designated by the Engineer. Pull lengths shall be a maximum of 1320 feet (1/4 mile) when using pickup machine. Pull lengths shall be a maximum of 800 feet when using any other equipment, to minimize the occurrence of cold longitudinal joints.

D. Use spreader box or other methods of spreading the material approved by the Engineer for small projects under 200 square yards, for irregular areas, for miscellaneous construction such as detours, sidewalks, and for initial leveling courses.

E. Unless otherwise designated or directed, place bituminous surface course more than three inches in total compacted thickness in two or more courses with no course exceeding three inches in compacted thickness. Top lift will be a two-inch minimum thickness.

F. Offset longitudinal joints 12 inches in succeeding courses and at least six feet transversely to avoid a vertical joint through more than one course. In the top course of minor collectors or larger facilities, restrict joint to one foot either side of the centerline of travel lane lines.

G. Provide sufficient equipment to compact the mixture to density meeting section 05000. Coordinate with an independent testing agency and the Engineer to develop a rolling pattern for compaction. Utilize the approved pattern as long as the compactive efforts are within specification.

1. Provide sufficient rolling equipment to keep pace with the laydown operation.

2. Use a release agent other than diesel fuel, unless specifically approved by Engineer.

H. Roll the surface longitudinally, beginning at the outside edge or lower side and proceeding toward the higher side. Overlap each pass of one roller over the preceding pass by at least one-half the width of the roller. For finish rolling, pneumatic rollers are required.

I. Place the bituminous mix as a continuous operation. Do not allow rollers to pass over the unprotected end of freshly placed mix. If so authorized and the end will be subjected to traffic, bevel the end at approximately 5:1 (horizontal to vertical). Make transverse joints by cutting back on the previous run to expose the full depth of the layer or course. Apply a light coat of bituminous tack coat, in conformance with Section 02505, on the contact surfaces just before fresh bituminous mix is placed against previously compacted mix. At bridge ends or at ends of other rigid-type structures, compact transversely as well as longitudinally.

J. Prevent traffic, including construction traffic, from crossing the vertical edge. Apply tack coat to the vertical edge prior to making another pass with the paver if the bituminous mix has cooled below 150□ F.

K. Adjust production of mixing plant and paving material delivery to obtain a continuous uninterrupted forward paving operation. Contractor will provide sufficient labor and equipment to ensure a continuous paving operation.

3.05 FINISH

A. Place the bituminous course to the line, grade, elevations, thickness cross section and finish as shown on the plans or as directed by the Engineer.

B. Minimum pavement section:

Road Class	Right of Way width	Bituminous Paving Course	U.T.B.
Residential	60’ or less	3” AC-10 (1/2” aggregate)	8”
Minor Collector	62’ to 68’	4” AC-20 (3/4” aggregate)	8”
Major Collector	82’	4” AC-20 (3/4” aggregate)	12”
Arterial	86’ or greater	5” PG 64-34 (3/4” aggregate)	12”

Note: For all roadways West of I-15 or in areas where the subgrade contains clay, install a minimum 4” pavement section (3/4” aggregate) unless specified by the Engineer. Geotextile fabric is required in roadways West of I-15, or in clay, under the base section or as directed by the Engineer.

C. Construction joints will be measured with a ten-foot straight-edge. When tested longitudinally across the joint, the surface cannot vary more than 0.013 feet in ten feet. Bring the joint into specification tolerance immediately after the paving machine has moved away.

D. The variation of the surface from the testing edge of the string line between any two contacts with the surface will at no point exceed 0.025 feet for longitudinal measurements. The variation of the surface from the testing edge of the straight-edge between any two contacts with the surface will at no point exceed 0.01 feet for transverse measurements. Correct all humps or depressions exceeding the specified tolerances at no expense to the City with a method approved by the Engineer.

3.06 WEATHER AND SEASONAL LIMITATIONS

A. Place bituminous surface course only between April 15 and October 15 and when the air temperature in the shade and the roadbed temperature are as noted in 3.04, B. Do not place bituminous surface course during rain, when the roadbed is wet, or during other adverse weather conditions.

B. Bituminous surface course can be placed after October 15 only upon written authorization from the Engineer. An extended warranty period, additional pavement depth, and/or other considerations may be required.

C. For cold weather patching, emergencies, or other situations where conditions do not comply with 3.04, B, all bituminous surface course placed will be considered temporary and will be removed and replaced in accordance with this section and Section 02115.

3.07 ACCEPTANCE

A. Refer to Section 05000, 5.02.

3.08 TEMPORARY SURFACING

A. Temporary bituminous resurfacing will be at least two inches thick and consist of HMA. HMA mix design must be approved by the Engineer. "Cold Patch" is not allowed.

B. At major intersections and other critical locations a greater thickness may be required by Engineer.

C. Place temporary resurfacing as soon as the condition of the backfill is suitable and leave in place until ready for permanent resurfacing.

D. Maintain temporary surfacing until removal and replacement with permanent surface course.

PART 4 MEASUREMENT AND PAYMENT

4.01 TEMPORARY RESURFACING

A. Material which is placed by the contractor for his convenience or to maintain traffic will be placed at no cost to the City. The unit price for temporary material shall consist of full compensation for furnishing, placing, maintaining, removing, and disposing of such temporary surfacing materials.

4.02 PRICE ADJUSTMENT

A. Price adjustments for deficient material will be as outlined in Section 05000, 5.03.

END OF SECTION

SECTION 02505

BITUMINOUS TACK COAT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required for brooming, washing, or otherwise cleaning of the area to receive the bituminous tack coat.

B. Furnish and apply liquid or emulsified asphalt to existing surfaces in conformity with the plans or as directed by the Engineer.

C. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02503 - Bituminous Paving Course.

C. Section 02513 - Bituminous Concrete Paving Materials.

D. ASTM D 2170 - Kinematic Viscosity of Asphalts (Bitumens)

PART 2 PRODUCTS

2.01 BITUMINOUS MATERIALS

A. Furnish bituminous materials as designated by Section 02513.

PART 3 EXECUTION

3.01 NOTIFICATION AND ACCESS

A. Forty-eight (48) hours prior to applying tack coat notify all residents or business owners as per Section 01041, 3.04.

B. Provide pedestrian access across tack coat by blotting excess oil with blotter material.

C. Keep pedestrians, vehicles, pets, etc. from tracking tack coat onto sidewalks or driveways.

3.02 APPLICATION OF TACK COAT

A. Uniformly apply to contact surfaces of previously constructed bituminous concrete or Portland Cement concrete and similar surfaces. Distribute at the rate of 0.05 to 0.15 gallons per square yard of surface. Apply tack coat with spray or brush to curbs, gutters, manholes, and waterways.

B. Prior to applying the tack coat, clean the surface to be treated so that it is free of dust or other foreign material as directed by Engineer.

C. For paving fabric installation, spray tack coat uniformly over the prepared surface by means of a pressure distributor at the rate shown on Table 02505-1, as recommended by geotextile fabric manufacturer or as determined by the Engineer. Tack truck operator will clean spray nozzles as they become clogged. If tack is over applied, blot excess tack.

TABLE 02505 - 1 TACK COAT APPLICATION RATES	
GAL/SY OF AC-10	EXISTING SURFACE CONDITION
.20	Tight, non-porous
.25	Cracked, weathered
.30	Cracked, open texture

Note: Within street intersections, on steep grades and in zones where vehicle speed changes are commonplace, the application rate will be reduced to 0.20 gallons per square yard.

D. Apply the tack coat when the temperature range of bituminous material at the time of application is such that the viscosity will be between 50 and 100 centistokes as determined in accordance with ASTM D 2170.

E. Repair any existing unstable sub-base or asphaltic concrete prior to tack coat application as directed by Engineer.

3.03 PROTECTION OF STRUCTURES

A. During the application of the tack coat protect all adjacent items, public and private, including curb and gutter, sidewalks, fencing, homes, vehicles, and landscaping from being spattered or marred by tack coat by covering with building paper or other suitable materials. Remove any spattering or marring that occurs.

B. Do not discharge bituminous material into borrow pits or gutters.

C. Dispose of all bituminous material off-site in an approved landfill at Contractor=s expense.

3.04 OPENING TO TRAFFIC

A. Do not permit traffic to travel over the tacked surface until the bituminous tack coat has cured so as not to be picked up by traffic. Apply blotter material to those areas where the asphalt has not been absorbed to avoid tracking.

B. If detours cannot be provided, restrict operations to a width that will permit at least one-way traffic over the remaining portion of the road.

C. If one-way traffic is provided, control the traffic by flagging or pilot car operation.

3.05 WEATHER LIMITATIONS

A. Apply tack coat only when the air temperature in the shade and the roadbed temperature are at least 50 degrees F. and rising.

B. Do no apply tack coat during rain, fog, windy, or other adverse weather conditions.

C. The temperature restrictions may only be waived upon written authorization from the Engineer.

END OF SECTION

SECTION 02510

BITUMINOUS SLURRY SEAL COAT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to apply a coat of liquid or emulsified bituminous material to an existing surface as shown on the plans or as directed by the Engineer for a slurry seal coat.

B. Remove excess loose cover material by vacuum type brooming.

C. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02503 - Bituminous Paving Course

C. Section 02513 - Bituminous Concrete Paving Materials

D. AASHTO T11/ASTM C117 - Standard Method of Testing for Amount of material Finer than 0.075mm sieve in Aggregate

E. AASHTO T19 - Unit Weight and Voids in Aggregate

F. AASHTO T27/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates

G. AASHTO T96/ASTM C131 - Resistance to Degradation of Small Size Coarse Aggregates by Use of the Los Angeles Machine

H. AASHTO T104 - Soundness of Aggregate by Use of Sodium Sulfate of Magnesium Sulfate

I. ASTM D 2170 - Kinematic Viscosity of Asphalts (Bitumens)

J. ASTM D 2216 - Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil-Aggregate Mixtures

K. UDOT Test Procedure 8-929 - Fractured Face Count of Coarse Aggregate

L. UDOT Test Procedure 8-945 - Dynamic Stripping Test of Bituminous Aggregate Mixtures

M. APWA Manual for Standard Specifications Section 32 01 13 Slurry Seal

PART 2 PRODUCTS

2.01 BITUMINOUS MATERIAL

A. Use bituminous material of the type and grade specified on the plans or proposal or as designated by the Engineer and conforming to the requirements of APWA Section 32 01 13.

B. The asphalt emulsion shall be CQS-1H or QS-1H. Each shipment of emulsified asphalt shall be accompanied by a certificate of analysis/compliance from the manufacturer.

C. Polymer modified emulsified asphalt shall be CQS-1H or QS-1H. The polymer modifier shall be either a solid synthetic rubber or latex material. The polymer modifier shall be combined with the base asphalt or asphalt emulsion at a minimum rate of 3% solids by weight of asphalt prior to loading at the manufacturing plant. The polymer modified emulsion shall be compatible with the mix design developed for the conventional slurry seal. Each shipment of emulsified asphalt shall be accompanied by a certificate of analysis/compliance from the manufacturer.

2.02 AGGREGATE

A. Use material consisting of natural or manufactured sand, slag, crushed fines or a combination thereof.

B. Furnish dry mineral aggregate, uniformly graded within one of the gradation limits specified below, as called for in the bid proposal when tested in accordance with AASHTO T-27/ASTM C136.

SLURRY SEAL COAT - AGGREGATE MATERIAL					
SIEVE SIZE	TYPE I Residential	TYPE II Arterial	TYPE III Arterial	TYPE IV Skid Res.	Stockpile Tolerance
1/2 inch	100	100	100	100	
3/8 inch	100	100	100	85-100	
No. 4	100	90-100	70-90	60-87	+/- 5%
No. 8	90-100	65-90	45-70	40-60	+/- 5%
No. 16	65-90	45-70	28-50	28-45	+/- 5%
No. 30	40-65	30-50	19-34	19-34	+/- 5%
No. 50	25-42	18-30	12-25	12-25	+/- 4%
No. 100	15-30	10-21	7-18	7-18	+/- 3%
No. 200	10-20	5-15	5-15	5-15	+/- 2%

The percentage of passing shall not vary from the high limit to the low limit on any two consecutive sieves.

C. The mineral aggregate shall meet the requirements of the table below when tested in accordance with AASHTO and ASTM methods.

MINERAL AGGREGATES		
PROPERTY	TEST METHOD	SPECIFICATION
Sand Equivalent	AASHTO T176/ASTM D2419	45 Minimum
Soundness, %	AASHTO T104/ASTM C88	15 Maximum
Abrasion Resistance, %	AASHTO T96/ASTM C131	35 Maximum *
Polishing	ASTM D3319	31 Minimum

* The abrasion test is to be performed on the aggregate before it is crushed.

D. Use aggregate of such a nature that when the particles are thoroughly coated with the bituminous material specified for the project, not less than 90 Percent of the coating is retained when tested in accordance with UDOT Test Procedure 8-945.

E. Use aggregate with a maximum dry unit weight of 100 pounds per cubic foot when measured according to the loose weight determination as described in AASHTO-19 and the moisture content determined according to ASTM D 2216.

2.03 BITUMINOUS ADDITIVE

A. Mineral Filler: The mineral filler shall be hydrated lime or Portland cement (Type I/II). The mineral filler shall be considered as part of the mineral aggregate. The quantity and type of filler, if required, shall be determined by the job mix design. It shall be used for one or more

of the following reasons: to improve gradation of the aggregate to provide improved stability and workability of the slurry, or to increase the durability of the cured slurry.

B. Set Control Additive: Set control additive may be used to accelerate or retard the break and set of the slurry mixture. The quantity and type of set control additive, if required, shall be determined by the job mix design and conform to the applicable section of ASTM D3910. Quantity of set control additive may be adjusted as required to maintain consistent stability and workability of the slurry mixture.

C. Water: Water for the slurry mixture shall be clear, potable, free from harmful soluble salts, and compatible with the slurry mixture.

PART 3 EXECUTION

3.01 PROTECTION OF STRUCTURES

A. During the application of slurry seal coat, protect all structures, curb and gutter, sidewalk, drive approaches, and manholes from being spattered or marred by covering with building paper or other suitable materials. If any spattering or marring occurs, correct at the expense of the contractor.

B. Do not discharge bituminous material into borrow pits or gutters.

C. Traffic Control: The seal coat shall be applied to alternating streets to allow sufficient time for the bituminous material to set and bond to the existing street. See Section 02519, Section 3.05.

3.02 WEATHER AND SEASONAL LIMITATION

A. Apply slurry seal coat only when the air temperature in the shade and the roadbed temperature are above 50□ F.

B. Do not apply seal coat during rain, fog, or other adverse weather conditions (such as danger of freeze within 24 hours).

C. Place seal coat after September 15 only upon written authorization from the Engineer and then only when the air temperature in the shade and the roadbed temperature are above 50□ F.

3.03 SURFACE PREPARATION

A. Do not place seal coat on newly constructed bituminous surfaces until seven days after such surfaces are laid.

B. Prior to placing the slurry seal coat, utilize a vacuum type power sweeper to clean the existing surface of all dirt, sand, dust, or other objectionable material. Weeds growing at the seam of the curb and gutter and the asphalt or at any other location in the roadway will be cut off at the level of the asphalt.

C. When placing a slurry seal coat, dampen the surface immediately prior to application of the tack coat or the slurry seal. All surfaces are to be uniformly damp with no free water standing on the surface or in cracks when the tack coat or slurry seal coat is applied.

3.04 APPLICATION OF SLURRY SEAL COAT MATERIALS

A. Equipment: Apply the slurry seal coat material using a mixer-spreader device specifically designed for slurry seals. Use a continuous-flow mixing unit capable of accurately delivering a predetermined portion of aggregate, water, and asphalt emulsion to the mixing chamber. The mixed material is to be spread using a mechanical-type squeegee distributor equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. There is to be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. Obtain Engineer's approval of equipment and methods prior to starting work.

B. Application of the Slurry Seal Coat:

1. Take care not to overload the spreader box which is towed at a slow and uniform rate not to exceed 5 miles per hour. The action of the squeegee in the spreader box will permit free flow of the slurry into all surface voids and cracks. Feed a sufficient amount of slurry to the box to keep a full supply against the full width of the squeegee. Do no permit that mixture to overflow the front sides of the spreader box. Do not seal adjacent lanes, except for lanes in which two or more boxes are used in tandem in placing the slurry, until at least two hours have elapsed between the placing of the one lane and that of the adjacent lane. Lap adjacent lanes at the edges a minimum dimension of six (6) inches which will provide complete sealing at the overlap.

2. When sealing extremely short lanes, the waiting period may be omitted if the adjacent lane can be sealed before the emulsion in the previously sealed lane has broken and started to cure.

3. Protect the fresh mix by barricades and markers and allow to dry for 4 to 6 hours depending on weather conditions.

4. In areas where the spreader box cannot be used, apply the slurry by means of hand squeegees. Correct any joints or cracks that are not filled by the slurry mixture by use of hand squeegees. Upon completion of the work, the seal coat will have no holes, bare spots, or cracks through which liquids or foreign matter could penetrate to the underlying pavement. The finished surface will present a uniform and skid-resistant appearance satisfactory to the Engineer. Remove all wasted and unused material and all debris from the site prior to final acceptance.

5. At all public intersections the contractor will be required to place slurry seal coat to the point of tangency of the intersecting streets.

3.05 OPENING TO TRAFFIC

A. Curing: Treated areas will be allowed to cure a minimum of four (4) hours. The contractor will protect the area for the full curing period with suitable barricades or markers, but traffic control must be removed to allow traffic flow by 5:00 PM. Areas which are damaged within 24 hours or prior to moving to a new map area shall be repaired at the contractor=s expense.

B. Cleanup: All material swept or blown onto the sidewalks, all trash, all discarded slurry material, or other refuse shall be collected on a daily basis, removed from the site and disposed of to a site approved by the Engineer.

END OF SECTION

SECTION 02511

ASPHALT PAVEMENT CRACK SEALING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to apply bituminous material to existing cracks in the pavement surface as shown on the plans or as directed by the Engineer.

B. Removal of foreign material and loosened particles with compressed air or other approved method.

C. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02513 - Bituminous Concrete Paving Materials

C. ASTM D 113 - Ductility of Bituminous Materials

D. ASTM D 3405 - Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements

E. ASTM D 3406 - Joint Sealant, Hot-Poured, Elastomeric-type, for Portland Cement Concrete Pavements

F. ASTM D 3407 - Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements

PART 2 PRODUCTS

2.01 MATERIAL

A. Crack Sealing Compound will be a homogeneous blend of materials combined to produce a material with the following properties:

1. Workability: Material will pour readily over specified application temperatures and penetrate 1/4 inch crack for the entire ambient temperature range recommended by the manufacturer.

2. Flexibility: A (1/8" x 1" x 6") specimen of the product conditioned to -16.6^{o} F will be capable of being bent to a 90^{o} angle over a 1-1/8" mandrel conditioned to -16.6^{o} F in 2 seconds without cracking. (State of Utah Test)

3. Curing: Product will cure sufficiently within 30 minutes of application, over the manufacturer's recommended ambient temperature range for application, to allow normal traffic without tracking.

4. Ductility: A standard specimen will be capable of being pulled a minimum of 30 cm at 1 cm/min at 39.2^{o} F. (State of Utah Test)

5. Force-Ductility: The standard specimen (see Ductility) will not exceed a force of 4 lb. during the specified elongation: 30 cm at a cm/min at 39.2^{o} F. (State of Utah Test)

6. Flow: Material will comply to ASTM D 3405, Section 4.3, Flow.

7. Viscosity: Material will have a viscosity of 500-900 centipoise at 300^{o} F, as determined by the Brookfield viscosity test method.

8. Specific Gravity at 60^{o} F, maximum 1.100.

9. Tensile Strength Adhesion: Material will comply with ASTM D 3406, Section 4.7 - Tensile Adhesion; except that sealant specimens will be cured 4 hours (not 7 days).

10. Asphalt Compatibility: There will be no failure in adhesion, or formation for an oily ooze at the interface between the sealant and the asphaltic concrete or softening or other harmful effects on the asphaltic concrete when tested at 140^{o} F.

11. Application Temperature: Material will have an application temperature of 370^{o} - 400^{o} F.

12. Softening Point: Material will have a minimum softening point of 200^{o} F as per ASTM D36.

B. Mixing of different manufacturer=s brands or different types of sealant is prohibited.

C. Contractor is to comply with state and local regulations to dispose of hazardous waste.

2.02 PRODUCT DELIVERY

A. Sealant material will be supplied pre-blended, pre-reacted, and prepackaged. Crack sealing blocks will not exceed approximately 30 lbs. If supplied in solid form, the blocks of completed material will be cast in a plastic or other dissolvable liner having the capability of becoming part of the crack sealing liquid. If the sealant is delivered as a liquid, the container and liquid will not exceed 30 lbs. The sealant will be delivered in the manufacturer's original sealed container, legibly marked with the manufacturer's name, the trade name of the sealer, the manufacturer's batch or lot number, the application temperature range, the recommended application temperature and the safe heating temperature.

2.03 QUALITY ASSURANCE

A. Failure to meet specification will not be cause for claim or extension of the contract. The contractor will be held liable for costs incurred in procuring and testing materials found to be out of specification.

B. Applicable Vendor Certificates indicating that the material complies with this specification will be required to accompany all shipments on this project.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove foreign matter and loosened particles with compressed air.

1. A minimum of 100 psi is required.

B. Clean crack to a depth of two inches or to the bottom of the crack, whichever is less.

3.02 EQUIPMENT

A. Use circulating hot oil heat transfer for heating the product (sealant machines). Direct heat transfer units (tar pots) will not be used. Product tank capacity of sealant placement equipment not to exceed 500 gallons. Alternate equipment must be approved by the Engineer.

3.03 TEMPERATURE CONTROL

A. Observe sealant manufacturer=s temperature application instructions. Contractor=s sealant units will have available at all times an operating ASTM 11-F thermometer with an intact mercury column or a certified, calibrated digital pyrometer, electronic thermometer, or equivalent direct reading temperature measurement device capable of reading within $\pm 50^{o}$ F from 200^{o} - 600^{o} F.

B. Material overheated in excess of 30° F. above the manufacturer's recommended maximum temperature for one hour or 60° F for one-half hour will be wasted at the Contractor's expense. Do not place material if the temperature is below the manufacturer's recommended minimum application temperature.

C. The procedure for loading material into the sealant tank will not depress the sealant temperature at the wand tip below the manufacturer's recommended minimum application temperature.

3.04 APPLICATION OF CRACK SEAL MATERIAL

A. Clean and seal across the full width of the bituminous surfacing including side slopes or as directed by Engineer.

B. Seal cracks when clean and dry and only upon inspection and approval by the Engineer.

C. The crack will be overfilled and immediately squeegeed to form a band-aid. The band will have the following configuration:

1. Band will extend a maximum of one inch on either side of the crack(s).

2. Maximum width of band will be four inches.

3. Band will have a maximum thickness of 1/16 inch. At least 90% of band placed will have a thickness of 1/16 inch ±1/64 inch.

4. Center band on crack.

D. Cracks in excess of one inch in width will be filled with one-half minus plant mix or road mix or as directed by the Engineer.

E. Where traffic or construction activities may cause tracking or pullout of sealant material, the Contractor will apply sand to the sealant as it is placed or utilize other approved method as directed by the Engineer.

F. Sealant material picked-up or pulled out will be replaced at Contractor's expense. Any damage to the traveling public resulting from sealant application or sealant pullout will be paid for by the Contractor.

3.05 OPENING TO TRAFFIC

A. Allow treated areas to cure for 30 minutes or until manufacturer's recommended set up time has elapsed.

END OF SECTION

SECTION 02513

BITUMINOUS CONCRETE PAVING MATERIALS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, additives, and equipment as required for the production of bituminous concrete paving materials by plant mixing and meeting the requirements of this specification.

B. Furnish all required material certifications and test data as required.

C. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Section 02503 - Bituminous Paving Course

C. Section 02505 - Bituminous Tack Coat

D. UDOT Section 402 - Asphalt Concrete Pavement

E. Comply with applicable AASHTO, ASTM, and UDOT test procedures

1.03 SUBMITTALS

A. Prior to using pavement mixes, submit a Marshall mix design using ASTM D 1559 procedures. With the mix design also submit the following information:

1. Mix suppliers name and address.

2. Mix designers name.

3. Bill of Lading from asphalt vendor showing asphalt grade and hydrated lime used, if required.

4. Calculation sheets justifying the following:
   a. Bitumen content in mix.
   b. Marshall stability - 1200 pounds minimum.
   c. Flow (0.01 inch) - 10 to 18.
   d. Voids content 2 - 4%.

B. If contractor opts to use a pre-approved supplier, submit the name and address of the supplier along with the mix design prior to using the mix on site. The contractor will conform to the following requirements:

1. The contractor will within 15 working days prior to the date of paving submit in writing which local supplier they will use.

2. Only one supplier can be used unless written approval from the Engineer is obtained. Under no conditions can an asphaltic mixture from different sources be used during the same day.

3. It is the contractor's responsibility to notify the City in writing 15 working days prior to paving if the supplier wishes to change their approved mix design.

4. Submit the Bill of Lading from the vendor for the bituminous material showing asphalt grade and hydrated lime used.

1.04 SAMPLING AND TESTING

A. Gradation and Bitumen Content: As per Section 05000, 5.01.A.

B. Sieve Analysis: As per Section 05000, 5.01.B.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Use bituminous material as specified in 2.02.A below.

2.02 ASPHALTIC CEMENT

A. Asphaltic Cement: Furnish asphalt cement meeting the requirements of ASTM D 3381, with the following modification. Delete the loss on heating requirement on residue from "Thin-Film Oven Test." Delete the ductility at 25° C. (77° F.) and replaced with ductility at 4° C. (39.2° F). Use the following values:

AC-10: greater than 15
AC-20: greater than 5

a. For arterial roadways use Performance Grade (PG) 64-34 meeting APWA specification Section 32-12-06 - Superpave.

2.03 ASPHALTIC EMULSIONS (SLURRY SEAL)

A. Anionic emulsified asphalt conforming to the requirement of ASTM D 977.

B. Cationic emulsified asphalt conforming to the requirements of ASTM D 2397.

2.04 AGGREGATE MATERIALS

A. Use mineral aggregate that consists of crushed stone, crushed gravel, or crushed slag conforming to the following requirements:

1. Comply with APWA Section 32-12-05.

2.05 HYDRATED LIME

A. Unless otherwise approved by the Engineer, the addition of hydrated lime will be added meeting the following requirements:

1. Anti stripping agent prohibited.

2. Add hydrated lime to the aggregate to increase the unconfined compressive strength of the bituminous mix. Determine the exact amount of lime to be added. Submit at least three complete Marshall designs and three sets of Immersion-Compression tests based on the mineral aggregate used and the amount of lime added to bring the material in compliance with the specifications. Engineer will approve the amount of lime added as a part of the mix design.

2.06 AGGREGATE GRADATION

A. Use an aggregate that the combined dry mineral aggregate is uniformly graded and of such size that it meets the gradations specified below when tested in accordance with AASHTO T-30. Use the gradation designated on the plans. When a specific gradation is designated do not use any other unless authorized in writing by the Engineer.

B. Gradation for Bituminous Paving Course:

3/4 INCH GRADATION

Sieve Size	Ideal Gradation (Percent Passing)	Ideal Gradation Tolerance
3/4 inch	100	0
3/8 inch	83	±8
No. 4	54	±8
No. 16	28	±6
No. 50	17	±6
No. 200	5	±2

1/2 INCH GRADATION

Sieve Size	Ideal Gradation (Percent Passing)	Ideal Gradation Tolerance
1/2 inch	100	0
No. 4	70	±10
No. 16	35	±7
No. 50	17	±6
No. 200	5	±2

b. For arterial roadways, meet APWA Specification Section 32-12-06.

PART 3 EXECUTION

3.01 MIXING AND PLACEMENT

A. Mix, place, and finish the asphalt concrete paving materials in accordance to the requirements of Section 02503.

END OF SECTION

SECTION 02575

"PERMITTED"
EXCAVATIONS AND RESTORATIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to perform all excavation for structures, trenches, roadways, disposal of excess material, dust control, and drainage.

B. Construct and remove all required asphalt, shoring, cribs, cofferdams, caissons, including all pumping, bailing, draining, sheeting, bracing, and related items.

C. Protect existing facilities, utilities, and structures affected by the excavation.

D. Secure and comply with all appropriate permits for the work in conformance with Ordinance #10-36.

E. Restore all disturbed structures, improvements, and property in conformance with these specifications.

F. Comply with all applicable sections of these specifications for all work included within the public right-of-way.

G. Obtain permit and provide traffic control as required.

H. Public Works Department Policy for Restoring Utility Pot-holes.

I. Public Works Department Road Excavation Moratorium Policy.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Division 2 - Site Work

C. Division 3 - Concrete

D. Division 5 - Material Testing

E. OSHA and other Safety Requirements

F. Appendix A - Sandy City Standard Details

G. Section 02447 - Monuments

1.03 CONTENTS OF SECTION

2.00 FORWARD

Statement of Intent: The purpose of this specification is to describe Sandy City Ordinance #10-36 and policies for issuing permits to work in the public way. These permits control excavation and construction operations. It is also implemented to cover special requirements for work in general, maintenance, private construction, and additions to utility systems in the public way. Nothing in this document will be construed as taking precedence over Ordinance #10-36.

A. Application: All conditions in this specification apply to all construction and maintenance work performed in the public way.

B. Revisions: This specification is subject to revision. The latest revision will always apply.

C. For the purpose of this specification, certain words and phrases are defined as in Sandy City Ordinance #10-36 unless it shall be apparent from the context that different meaning is intended.

3.00 POLICIES

A. Policy for Permit Required for Work in the Public Way: It shall be unlawful to: interrupt or alter vehicular and pedestrian traffic, construct, reconstruct, or alter any opening, excavation, tunnel, sidewalk, curb gutter, driveway, street, or to perform any other work of any kind to the public way which will result in physical alteration thereof unless such person shall first have obtained a permit for the performance of such work and said work shall be performed in conformity with the terms and provisions of Sandy City Standard Specifications and Ordinance #10-36 and of the permit or permits issued hereunder, accept as hereinafter specifically provided.

B. Policy for Permit Required for Occupation of Street with Building Material: It shall be unlawful for any person to occupy or use any portion of a public way for the storage of construction or landscaping material and/or equipment without first making application for and receiving a permit from the City. The permit may set forth such restrictions as required by ordinance or by the Engineer. No fence construction pursuant to these ordinances and no building material shall remain in place in any public way after the ending date of the permit, unless said permit is extended by the Engineer.

C. Policy for Permit Required for Scaffold, Barricades Over/or in the Public Way: It shall be unlawful for any person to erect, maintain, or use any scaffold, fence or any other temporary structure over or in the public way without first obtaining a permit for that purpose and paying the fee for such permit.

D. Policy for Permit of Water Service Line Replacement: Replacement of water line service from meter located in the public way requires a permit.

E. Policy for Required License and Bond: Persons desiring to perform work in the City's public way shall be properly licensed in the State of Utah and post a performance bond on a form provided by the City. The bond amount shall be a minimum of **$10,000.00** and shall remain in full force and effect for a period of three years from the date the work is completed. A single bond may be posted by a permittee to guarantee performance for one or more permits if approved by the City Engineer and agreed to, in writing, by the bonding company. The minimum bond amount shall be assessed based on the number of permits issued to each permittee over the past three year period, as per the following chart, subject to the review and approval of the City Engineer:

Number of Permits Past Three Years	Required Bond Amount
1-10	$10,000
11-20	$15,000
21-50	$20,000
51 or greater	$25,000

The City may require an additional bond upon determination by the City Engineer that the scope of the work exceeds the minimum bond amount, in which case, the total bond amount will be equal to the scope of the work as estimated by the City Engineer. The acceptable licenses include:

	TYPE OF LICENSE	NUMBERS
1.	General Engineering	E100
2.	General Building	B100
3.	Residential and Small Commercial	R100
4.	General Electrical	S200
5.	General Plumbing	S210
6.	General Concrete	S260
7.	General Masonry	S290
8.	Excavation and Grading	S310
9.	Landscaping	S330
10.	Fire Suppression Systems	S370
11.	Sewer and Water Pipeline	S390
12.	Asphalt Paving	S400
13.	Pipeline and Conduit	S410
14.	General Fencing and Guardrail	S420
15.	Sign Installation	S440

Note: The City Engineer will review the license type to ensure it is applicable to the work being performed.

Exceptions: A license shall not be required by the City when the permittee is:

1. A property owner performing work in an area which abuts only his property of residence and the work does not exceed 500 square feet of drive approach, or 100 linear feet of sidewalk, or installing a sprinkler system.
2. A Public Utility Company franchised in Sandy City.

F. Policy for Applications for Permits: Any person desiring to perform any work of any kind described in Ordinance #10-36, shall be subject to this specification and shall make application for a permit. Such application shall be filed with the Public Works Department on the form provided by the City. Any work involving installation or alteration of a permanent facility or structure in the public way will require the filing of engineered plans, traffic plans, and specifications showing the proposed work in sufficient detail to permit determination of such relationship and compliance, and the application shall not be deemed approved until such engineered and traffic plans or sketches are filed and approved. The Engineer may deny issuance of permits to contractors, utility companies, or other permit Applicants who have shown by past performance that in the opinion of the Engineer they will not consistently conform to this specification, Sandy City standard specifications, or the requirements of ordinance #10-36. Engineer may also require construction drawings and specifications for any permit application.

G. Policy for Requirement of Traffic Plan: Prior to City issuing a permit, a traffic plan must be submitted by the permittee for review and approval by City traffic personnel. Traffic plan is to be in conformance with current Manual of Uniform Traffic Control Devices (MUTCD) and approved prior to excavation, construction, or any occupation of the Public right-of-way.

H. Policy for Commencement of Work: It is unlawful for any person to commence work in the public way until the City has approved the application and until a permit has been issued for such work, except as specifically provided to the contrary in this specification. Duration of the permit shall be set at the time of issuance of the permit. If work is not completed in sixty (60) days, the permit will expire. An extension may be applied for and must be issued prior to commencement of any further work.

I. Policy for Assessing Permit Fees: The City shall charge and the Permittee shall pay upon issuance of the permit, fees for costs associated with the work performed under the permit as outlined in the Fee Schedule adopted by the City Council. Such costs could include costs for reviewing the project and issuing the permit, inspections of the project, deterioration of the Public Way, or diminution of the useful life of the Public Way, and other costs to the City associated with the work to be done under the permit. All costs shall be assessed in a non-discriminatory manner.

1. Engineer may waive permit fees as outlined in section 3.00, K of this specification.

2. Additional charges to cover the reasonable costs and expenses of any required engineering review, inspection, and work site restoration associated with each undertaking may be charged by the City to each permittee, in addition to the permit fee.

J. Policy for Determining when Permit Waivers can be Granted: Working in the public way without a permit violates Ordinance #10-36, unless the permit is waived by the Engineer. Notwithstanding the waivers granted below, all persons working in the public way shall properly protect travelers thereon by compliance to the current MUTCD.

A permit waiver does not preclude the requirement of a traffic control plan approved by the Engineer when traffic must be routed around or through construction sites. Waivers can be granted by the Engineer when any of the following conditions occur:

1. When routine maintenance work which is being done by City, State, County or public utility company personnel and work does not involve excavations in the City's public way, i.e., crack sealing, street resurfacing, snow plowing, sanding, salting, sweeping, garbage collection, storm drain cleaning, leaf pick up, above-grade work, street striping etc.

2. Landscaping and Landscaping Maintenance.

3. When work involves the installation of a sprinkling system, provided such work does not require the excavation of park strip area in excess of twenty-four (24) inches and provided such work does not result in usage of heavy equipment or cause damage to the public facilities and landscaping in the public way outside of the work area. Heavy equipment in this regulation means any tools other than hand tools and a power trencher as described in landscaping definitions.

4. When minor adjustment to utility meter, valves, or manholes in the park strip area is required and provided that said adjustment does not result in:

   (a) excavation in the park strip area in excess of forty-two (42) inches in depth or fifteen (15) square feet in area;

   (b) any alterations or damage to the public or private facilities.

   (c) the use of heavy equipment,

5. When a permittee allows other contractor or utility companies to perform work in the said permitted trench limits.

6. When authorized materials are stored in the public way in compliance to the provisions of the MUTCD.

K. Policy for Issuing No Fee Permits: Engineer reserves the right to issue no-fee permits for work in the public way. A no-fee permit does not preclude the requirement of a traffic control plan approved by the Engineer when traffic must be routed around or through construction sites, nor does the fee waiver preclude notification for inspection forty-eight (48) hours in advance.

Fee waivers may be granted by the Engineer when any of the following conditions occur:

1. When the City Council formally waives the fee.

2. When abutting property owners are replacing or repairing any kind of existing public facility such as drive approaches, sidewalk, or any combination thereof.

3. When a public utility company (not a subcontractor to the public utility company) is doing excavation work, if so stipulated in an existing franchise.

4. When city personnel are installing, repairing, or maintaining public way facilities and such work requires excavation.

5. When frames and lids for underground structures in paved areas are raised or lowered.

6. When development installs new utilities prior to permanent surfacing placement. However, any encroachment into permanent surfacing will not be granted a fee waiver.

7. When the Engineer determines the work covered by the permit is an obstruction only and will not have a detrimental effect on the existing improvements.

8. When utility companies are doing excavation work and such is required by a City project and the work is required to be accomplished prior to or during execution of the City contract.

9. City contractor performing excavation for a Capital Improvement project.

L. Policy for Revoking "Permit Waivers" or No Fee Permits: "Permit Waivers" and No Fee Permits may be revoked by the Engineer if the work is unsafe, defective or requires action or supplemental inspection by the Engineer. Prior to revocation, the Engineer will serve written notice defining the problems encountered and the time the permittee has to correct the problem, except for the case of immediate safety, where a stop work order will be issued by the Engineer. If the work is not satisfactorily corrected, in the time specified, the "permit waiver" will be revoked and the permittee will be required to secure a "Fee Permit" before proceeding with the work.

M. Policy for Completion of Work by City and Liability for Costs: If the work is unduly delayed by the permittee, or if the public interest or safety so demands, the City retains the authority to restore the public way to active use by providing backfill, road base, asphalt paving, concrete, etc. as deemed necessary by the Engineer. The City shall do the work only after written notice has been given to the permittee and the permittee fails to respond to the Engineer's request within the time frame outlined, except when public safety is jeopardized. The time, material, and equipment cost of such work incurred by the City shall be paid by the permittee or his bond.

N. Policy for Extending Permit Construction Time Limits: Subject to Engineer's approval, permits which have expired may be extended up to 30 days from expiration date by submitting to the Engineer acceptable reasoning for the delay. Extending time limits beyond normal working hours requires prior approval by Engineer.

O. Policy When Construction Practices and Material do not Meet City Specifications: If the Engineer determines construction practices and/or materials, i.e., backfill, road base, asphalt and/or concrete, do not meet City specifications, the Engineer may:

1. Suspend or revoke the permit;

2. Issue a stop work order;

3. Order removal and replacement of faulty work;

4. Require an extended warranty period;

5. Negotiate a cash settlement to be applied toward future maintenance costs; and/or

6. Make demand upon the permittee’s bond to correct faulty work.

Note: **Settlement of trench backfill, road base, asphalt and/or concrete will be incontrovertible evidence of inadequate compaction of fill material.**

P. Policy for Work in the Public Way without a Permit:
A stop work order may be issued by the Engineer directed to any person or persons doing or causing any work to be done in the public way without a permit. Any person found to be doing any work in the public way without having obtained a permit, as provided in this specification, shall be required to pay a permit fee as well as penalties outlined in the fee schedule.

Q. Policy for Other Highway Permits: Holders of Permits for work on highways owned or under the jurisdiction of other government entities, but located within the city limits, shall not be required to obtain permits from the City under the provisions of this ordinance, unless the work extends beyond the back side of the curb, or beyond any other designated jurisdictional boundary. **Any City permit shall not be construed to permit or allow work on another jurisdiction roadway within the City.**

4.00 GENERAL CONDITIONS

A. Right-of-way Improvement Drawings: Right-of-way improvement drawings shall conform with all respects to the Engineers Design and Platting Standard Regulations. The Engineer requires one (1) drawing showing proposed changes to curb, gutter, sidewalk, street pavement, or drainage facilities. A drawing and calculation for Surface and Storm Water Runoff must be included.

B. Utility Drawing Requirements: Whenever the work involves the extension, placement, or the relocation of a utility facility one (1) copy of the drawing shall be submitted to the Engineer which details the location and type of proposed facility. Work involving maintenance of existing facility does not require a drawing. A drawing showing all existing utility lateral locations, sidewalk, edge of oil, and side lot lines is required on the permit form for any new laterals.

C. Permit and Drawings at Job Site: When the work is in progress, the permittee shall have at the work site a copy of the permit, traffic control plan and City approved drawings.

D. Preconstruction Meeting at Job Site: When trench length will equal or exceed fifty (50) linear feet or as determined by Engineer, the permittee is required to schedule and attend a preconstruction meeting with City personnel at the job site prior to construction.

E. Emergency Work: Maintenance of pipelines or facilities in the public way may proceed without a permit when emergency circumstances demand the work be done immediately provided a permit could not reasonably have been obtained beforehand. Anyone performing emergency work in the public way will notify the Public Works Department prior to any work commencing in the public way. Any person performing emergency work which does not occur during regular business hours, shall notify the Sandy City Police Department at 840-4000 within one (1) hour and the City Engineer (558-9703).

F. Notification: It will be the responsibility of the permittee to notify Public Works, Public Utilities and businesses and residents effected by the work. Permittee shall coordinate work around school zones, garbage collection, postal service, and resident's homes. Except as otherwise allowed in emergency or road closure situations, Public Works will be notified by the permittee forty-eight (48) hours, prior to commencing work (568-2999). The following information will be provided by phone: permit number, name, and telephone number of permittee, date/time work is to commence and cease, and location of work. For road closures permittee will be required to notify Fire Department and Police Department 840-4000 at least 48 hours in advance of all closures.

G. Resurfacing Time Limits:

1. Arterial or collector street pavement surfaces must be replaced within three (3) calendar days of excavation or on the same day in which backfill is completed. All other streets must be resurfaced within five (5) calender days from beginning of excavation or on the same day in which backfill is completed. If work is expected to exceed the above duration, the permittee shall submit a detailed construction schedule for approval. The schedule will address means and methods to minimize traffic disruption and complete the construction as soon as reasonably possible. Work shall not proceed until the schedule is approved by the Engineer and shall cease if the schedule is not maintained. In the event that the construction schedule or resurfacing time limit is exhausted and the work site is hazardous to citizens or impeding traffic, the City will take the necessary steps to make the work site safe and impose Penalties daily, as outlined in the fee schedule.

2. Excavations in the parkway must be completed and backfilled **within five (5) working days** unless otherwise approved by Engineer.

3. Submittal: Upon the City's request, the permittee shall provide certification from an approved material testing laboratory that the materials to be installed under permit are within the City's specification. Only City approved materials shall be used in the work.

H. Testing: Laboratory testing for materials, compliance, densities, and strength are the responsibility of the permittee. Testing service must be in accordance with Sandy City standard specifications; Sec. 05000. Engineer may require additional inspection or material testing as needed. All materials shall be tested for conformance to Sandy City Standard Specifications for any trenching exceeding or equal to 50 lineal feet. Should it be necessary for the City to perform compliance testing, the City shall back charge the permittee for additional testing performed should any testing reveal noncompliance with City specifications. The back charge rate shall be the cost of time and equipment to conduct the testing. The Engineer shall not back charge permittee if the testing confirms compliance with the City specifications.

I. Survey Monuments: When work may disturb or damage existing Survey Monuments, a "Salt Lake County Surveyor's Office Monument Permit" must be obtained. Work may not proceed until the procedure and requirements outlined in the Permit have been followed and complied with. Permittee is required to replace the monument in conformance with the requirements of the Permit.

J. Preconstruction Photographs of Existing Public Way Improvements: Prior to commencing the permit work, the permittee is encouraged to secure video tape or photographs which positively identify the condition and existing damages to the public way improvements such as curbing, sidewalk, landscaping and asphalt surfaces etc.

K. Maintenance of Drainage Channels: Existing drainage channels such as pipes, gutters, or ditches shall be kept free of dirt, construction materials, or other debris such that natural flow will not be interrupted. When it is necessary to block or otherwise impede flow of the drainage channel, a proposed method of maintaining the flow must be submitted for approval by the Engineer prior to a blockage of the channel. Permittee shall not allow dirt or other debris from his work to enter the City's storm drain system. Failure to comply may result in a penalty equal to cost incurred to correct or prevent damage. State and Federal penalties may be imposed as well.

L. Failure to Comply; Default in Performance: Any permit may be revoked or suspended and a stop work order issued by the Engineer, after notice to the permittee for:

1. Violation of any condition of the permit, the bond, or of any provisions of Ordinance #10-36;

2. Violation of any provision of any other ordinance of the City or law relating to the work; or

3. Existence of any condition or the doing of any act which does constitute, may constitute, or cause a condition endangering life or property.

A suspension or revocation by the Engineer, and a stop work order, shall take effect immediately upon entry thereof by the Engineer and notice to the Person performing the work in the Public Way. Notice to the Person performing the work shall be accomplished when the Engineer has posted a stop work order at the location of the work. Subsequent to posting a stop work order, written notice will be mailed, return receipt requested, to the address indicated by the Permittee on the permit.

Whenever the Engineer finds that a default has occurred in the performance or any term or condition of the permit, written notice thereof may be given to the principal and to the surety on the bond. Such notice shall state the work to be done, the estimated cost thereof, and the period of time deemed by the Engineer to be reasonably necessary for the completion of the work.

In the event that the surety (or principal), within a reasonable time following the giving of such notice (taking into consideration the exigencies of the situation, the nature of the work, the requirements of public safety and for the protection of Persons and property) fails either to commence and cause the required work to be performed with due diligence, or to indemnify the City for the cost of doing the work, as set forth in the notice, the City may perform the

work, at the discretion of the Engineer, with City forces or contract forces or both, and suit may be commenced by the City against the Permittee (contractor) and bonding company and such other Persons as may be liable, to recover the entire amount due to the City, including attorney fees, on account thereof, in the event cash has been deposited, and suit brought for the balance due, if any.

5.00 PROTECTION OF PUBLIC DURING CONSTRUCTION

A. Conformance to Existing Laws: The permittee shall be responsible for being fully informed of all Federal, State, and local laws, ordinances, rules and regulation which, in any manner, affect the work, and at all times shall observe and comply with such laws, ordinances, rules and regulations.

B. Traffic Interruption: Construction operations will be conducted in a manner that will minimize interference or interruption of roadway traffic, except during emergency conditions, or unless authorized by the Engineer. Construction operations such as excavation, backfill, and pavement restoration on arterial/collector streets shall be prohibited during peak traffic hours of **7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.** Permittee shall notify all local Emergency Response Services in the City forty-eight (48) hours in advance of all road closures.

C. Manual of Uniform Traffic Control Devices: All provisions of the current "MUTCD" shall be adhered to. This manual provides regulations concerning traffic control, construction barricades, road closures, public and private access, and traffic control signing. Traffic control devices, as required by the "MUTCD", must be in place before traffic disturbance or excavation begins. The devices shall be maintained throughout the construction period and not removed until all equipment and materials are removed, excavation is backfilled, and temporary or permanent surface is installed. Traffic Engineer may require certified traffic control personnel during set up and tear-down of all traffic control devices. Lighted early warning arrow boards will be required on all major arterial and collector streets. The permittee shall not obstruct the view of any traffic control devices. All disturbed traffic control devices shall be immediately replaced, cleaned or repaired as directed by the City.

D. Public Access: Permittee shall provide free and unobstructed access to all pedestrian crosswalks, handicap access ramps, driveways, mailboxes, trash receptacles, fire hydrants, water gates, valves, manholes, drainage or other public service structures and property that may be required for emergency use. Permittee shall not remove such public service facilities and property or relocate same without proper coordination with the authorities charged with control and maintenance of same. Barricades in conformance with "MUTCD" or covered walkways for the protection of the general public shall be provided whenever any work or storage of materials is being done.

E. Private Access: Temporary, all-weather roadways, driveways, walks, ADA access ramps and private rights-of-way for vehicles and pedestrians shall be constructed and continuously maintained by the permittee when public facilities are disturbed or when required by this specification or the permit. Temporary ADA ramps shall not impede the flow or collection of storm water, meet all ADA requirements, and be located where pedestrians may safely cross and continue movement. Where crossing is not possible, pedestrians must be provided safe/protected movement along side of the work zone. Use of fencing, lighting, flaggers or other devices may be required as directed in the approved Traffic Control Plan.

F. Contractor Information: When personnel and equipment are not on-site, permittee shall clearly post on barricades in letters two (2) inches high, emergency information consisting of the name and emergency telephone number of permittee, bearing such information, be placed at every job site and maintained until the work is complete and formally accepted by the City. Copies of the permit shall be available from the Engineer and be open to public inspection during office hours.

G. Right-of-Way Excavation in Winter: Excavation of City right-of-way during winter months (herein as defined as October 15 to April 15) will be allowed only if the work is a new service connection, required maintenance, emergency, or otherwise approved by the Engineer. Permanent repair of City right-of-way excavated in the winter may be delayed up to 90 days with an approved extension but in no case later than May 15, provided the Permittee installs and maintains a temporary asphaltic surface until such time as the permanent surfacing is accomplished. Permittee must submit information concerning the source, availability and type of patching material prior to obtaining a permit. Warranty will not commence until a permanent surface is installed.

6.00 EXCAVATION OPERATION

A. Locating and Protecting Existing Utilities: The permittee shall notify Blue Stakes (532-5000) at least two (2) working days prior to commencing work, and use extreme caution to avoid conflict, contact or damage to existing utilities such as water lines, storm drain lines, power lines, gas lines, street lights, fiber optic lines, telephone lines, television lines, sewer lines, poles and appurtenances during the course of construction. For excavations within a 200 ft. radius of a traffic signal, permittee shall also notify, (2) working days in advance, Salt Lake County (562-6452) for Sandy City signals and (965-4276) for State Highways within the City. In case damage occurs, the permittee will notify the utility or company involved and Sandy City Public Works Department (568-2996). **If street lights are damaged, contact Public Utilities at 568-7280.**

B. Narrow Trenches: Trenching 24 inches or less in width, unless otherwise specifically authorized by the City, shall utilize a "Flowable Fill" as back fill above the pipe zone to finish sub-base elevation. At the conclusion of the "Flowable Fill" placement, if asphalt placement cannot be installed,(1) one inch thick steel plating shall be installed over the excavation, overlapped a minimum of (1) one foot on all sides and secured in place by tack welding or underpinning such to eliminate displacement of the plates. Installation of permanent surfacing will occur as soon as the flowable fill has sufficient time to cure.

C. Protection of Paved Surfaces Outside of Excavation Area: In order to avoid unnecessary damage to paved surfaces, backhoes, outriggers, track equipment or any other construction equipment that may prove damaging to asphalt are required to use rubber cleats or paving pads when operating on or crossing said surfaces.

D. Jacking or Boring of Buried Conduits: Jacking or boring of service line laterals under paved surfaces is preferred to trench excavation and may be required in some City Streets as designated by Engineer. If open excavation for service laterals is requested in a street which was paved or resurfaced within the last two years, an engineering evaluation and explanation of why jacking is not feasible shall be presented to the Engineer. Engineer shall approve or disapprove the application based on the merits of the arguments presented.

E. Tunneling: Tunneling is not allowed except when written permission is obtained from the Engineer. When permission is given, an approved flowable fill will be required as backfill material.

F. Cutting of Sidewalks, Curbs, Gutters etc.: Removal or alteration of any existing improvements, structures, landscaping or any other facility in the Public Way that is in conflict with the proposed excavation will be identified on the Permit. Sidewalk and curb & gutters shall be saw-cut and removed to the nearest control joint (or score line). High-back curbs may be saw cut for drive approaches in conformance with Sandy City Standard Details when prior approval is obtained from the Engineer. Any existing improvements damaged by operations outside of the limits of the trench, shall be repaired or replaced in conformance with Sandy City Standard Specifications.

G. Cutting Pavement:

1. All pavements shall be cut in neat vertical straight lines prior to excavation. All excavations within twenty-four (24) inches of any structure, concrete, or edge of existing pavement surface shall remove and replace permanent surfacing to the concrete or structure. If more than 50% of the permanent surfacing of a traveled lane is impacted by the excavation, the entire lane width will be required to be saw cut, removed, and replaced as per City standards. Trenching or excavation is not permissible within eighteen (18) inches of any concrete or structure, unless permitted by the Engineer. Any surface or underlaying pavement outside the trench which is undermined or damaged by the trenching operation shall be

removed to a neat, straight line, and replaced. In some areas where native, clean sands are present the Engineer may require that trenching exceeding five (5) feet in depth be required to remove and replace surfacing for a minimum of two (2) times the depth unless direct contact shoring is provided to fully support the trench walls for full depth of the excavation. The use of drop hammer pavement cut is not allowed. Saw cutting or use of a (jackhammer) pavement breaker for cutting pavement are the only acceptable cutting methods.

2. All surface restoration shall utilize mechanical lay-down equipment for permanent asphaltic concrete restorations unless otherwise approved by the Engineer.

3. Portland Cement Concrete Pavement (PCCP) is to be Double Saw Cut full depth in accordance with Sandy City Standard Specifications to facilitate removal without damaging adjacent pavement. Coordinate removal with Inspector.

H. Open Trench:

1. Unpaved and open trench lengths shall not exceed 700 lineal feet of right-of-way. Three hundred fifty feet (350 ft.) may be under construction while three hundred fifty feet (350 ft.) is being paved. Construction of manholes or other appurtenances requiring added construction and cure time may be left unpaved for additional time provided they are properly barricaded. The Engineer may adjust these limits if conditions warrant.

2. All open trenching within the Public Way shall be barricaded and covered in conformance with the Manual on Uniform Traffic Control Devices (MUTCD). No open trenching deeper than one and one half (1-1/2) inches will be allowed over night. Any disturbed surfacing will be stable, compacted or temporarily surfaced at the end of each day. In certain circumstances the Engineer may allow deeper trenches left overnight with proper protection, but in no case more than five (5) feet deep.

7.00 BACKFILLING OPERATIONS

A. Compaction Equipment: The permittee shall not commence backfilling until approved compaction equipment is on-site. Should backfilling commence without having approved equipment on-site, the Engineer may require the permittee to remove and replace the backfill material=s and/or revoke the permit. Compaction equipment shall be capable of providing required compaction as outlined in Sandy City Specifications.

B. Backfilling Material Below the Base Course: Backfill material in the trench below the base course shall comply with Sandy City Specification Sec. 02230, ASHTO M-145 A-1, A-2, or A-3. Native silty-sands typically comply with this standard.

C. Backfill in Pipe Zone: Backfill in the pipe zone shall conform to the respective utility specification and/or Sandy City Standard Specifications. An average of ninety-six (96) percent compaction with no determination less than 92 percent of ASTM D-1557 mod. proctor is required.

D. Placement of Backfill Lifts: Place backfill lifts such that the new utility is not displaced or damaged.

1. Maintain specified lift thickness and compaction density throughout the backfill in compliance with Section 02240 and 05000 of Sandy City Specifications.

2. Place backfill with +/- 2% of optimum moisture content. Moisture shall be applied uniformly to material.

3. Place backfill within the pipe zone at maximum eight (8) inch lifts, and a maximum of twelve (12) lifts between the pipe zone and subbase.

4. Mechanically compact each lift to ninety-six (96) percent average compaction of ASTM D-1557 Modified proctor, with no determination less than ninety-two (92) percent.

5. Ensure final lift is smooth graded to bottom sub-base elevation prior to placement of untreated base course.

E. Base Course Material: Untreated base course material shall comply with Sandy City Specifications section 02230 “Materials.” Match existing untreated base course depth or eight (8) inches, whichever is greater , for roadways whose Right of Way is less than sixty (60) feet, or less and twelve (12)inches (UTB) in eight (8) inch max. lift thickness for roadways where Right of Way is sixty (60) feet or greater. Place and compact in conformance with Sandy City Standard Specifications sec. 05000, average of ninety-six (96) percent compaction with no determination less than ninety-two (92) percent of ASTM D-1557 mod. proctor.

F. Controlled Density Backfill: Flowable Fill shall be used in excavations where conventional compaction and testing equipment cannot be used, i.e., narrow trenching twenty-four(24)inches or less in width or tunneling. Submit to Engineer for approval a mix design with twenty-eight(28) day maximum compressive strengths of 50 to 150 PSI. Place fill with 8 to 10 inch slump consistency. Install on native undisturbed trench bottom to the bottom of the proposed resurfacing depth.

G. Compaction: Compaction shall be determined in accordance with Sandy City Specifications section 05000 “Material Testing” and “Backfill and Embankment” section 02240. In place density testing is required in excavations exceeding fifty (50) feet in length. Sandy City Inspector may require in place density testing if inadequate consolidation is being obtained.

8.00 RESURFACING

A. Restoration of Right-of-way Improvements: All improvements and appurtenances impacted or damaged by the permittee shall be restored or replaced to an acceptable condition, equal in size, line and grade by the permittee. All restoration shall comply with Sandy City Standard Specifications. Application for exceptions must be in writing and approved by the Engineer.

B. Gravel Surfaces: Gravel surfaces shall be brought into compliance with current Sandy City Specifications and to their original condition. The surfacing material shall meet current Sandy City specifications for quality and the thickness of eight (8) inches. Gravel surfacing material shall be approved by the Public Works Inspector. Care shall be taken to not contaminate existing gravel surfaces inside or around the trench area. All contaminated materials shall be removed and replaced with approved materials at permittee's expense.

C. Concrete Surfaces: Concrete pavement, joints, and surfaces shall be made to match the line, grade, and joint pattern of original surfaces. The thickness of concrete shall be equal to the adjacent concrete plus one (1) inch. All tie bar dowels, reinforcing steel and joint patterns shall be approved by the Engineer prior to installation. Concrete used for pavements, sidewalk, curb & gutters, and drive approaches shall meet the requirements set forth in the Sandy City Standard Specifications. Concrete pavement shall conform with Section 03500. No partial panel replacement will be allowed.

D. Temporary Surfaces: Temporary surfacing will be utilized from October 15 through April 15. Engineer may allow permanent surfacing in certain circumstances when weather permits and acceptable materials are available. Temporary surfacing shall be replaced as soon as conditions are suitable for permanent resurfacing but no later than May 15. If the permit expires before permanent surfacing is installed, a permit extension or a new permit will be required. Any expired permits with temporary surfacing in place later than May 15 will be assessed penalties, be required to obtain an additional permit, and will be required to replace the temporary surfacing within the time frame outlined. During the time temporary surfacing is in place, the surfacing shall be maintained by the permittee in good condition such that it does not create a tripping hazard or disrupt pedestrian or vehicular traffic. If the temporary surfacing is removed or destroyed, the surfacing shall be replaced and the surrounding area cleaned by the permittee. Temporary surfacing shall comply with the following:

1. Temporary bituminous resurfacing three (3) inches thick shall be placed and maintained wherever excavation is made through street pavement or driveways. At major streets, intersections and other critical locations, a greater thickness may be required. In sidewalk areas, the temporary bituminous resurfacing shall be at least two (2) inches thick. When asphalt placement cannot be installed, minimum one (1)

inch thick plating shall be temporarily installed over the excavation plus one (1) ft. minimum overlap on all sides and secured in place by tack welding or underpinning so as to eliminate displacement of the plates. The bituminous mixture used for temporary trench resurfacing may be furnished from stockpiles or directly from the plant mixer and may be laid hot or cold, at the option of the permittee.

E. Bituminous Materials: Bituminous material shall comply with the requirements of Sandy City standard specifications section 02513 "Bituminous Concrete Paving Materials." The 1/2 inch gradation is required for the surface course. Ambient temperatures of forty five (45) degrees are required for permanent asphalting.

F. Tack Coat: Tack coat the exposed vertical edges of asphalt. Concrete shall be tack coated as required per Sandy City standard specification section 02505.

G. Pavement Restoration:

1. For surface restorations of bituminous surfaces, install asphalt equal to the adjacent depth plus one (1) inch but not less than four (4) inches. Asphalt depth shall be a maximum of six (6) inch depth with a maximum compacted three (3) inch lift thickness. Excavation of a street which has been paved, overlaid, or reconstructed within the past two (2) years requires authorization by the Engineer and a seal coat shall be required in all cases. Install Seal Coat in conformance with Section 02510 of the Sandy City Standard Specifications. Extend the Seal Coat twenty-five(25) feet beyond the excavation in both longitudinal directions and for each lane affected transversely with a minimum five (5) foot lateral overlap beyond the excavation.

2. Portland Cement Concrete Paving (PCCP) surfaces shall equal the adjacent paving depth plus one (1) inch but not less than seven (7) inches. Concrete paving work shall conform with current Sandy City Standard.

H. Compaction: Compact each lift in conformance with Sandy City Standard Specifications section 02503. Asphalt compaction shall be accepted when density determinations average 96 percent or better with no density determination less than 92 percent by a 50 blow laboratory Marshall (AASHTO T-245) in compliance with Sandy City specifications section 05000.

I. Bituminous Seal Coat: When required by the City, seal coat shall conform to the Sandy City Standard Specifications section 02510. The seal coat will be extended twenty-five(25) feet beyond the excavation in both longitudinal directions and for each lane affected transversely with a minimum five (5) foot lateral overlap beyond the excavation, unless otherwise directed by the Engineer.

J. Finishing of Asphalt Surfaces: Deficiencies or variations in existing surfaces within ten (10) feet of all sides of the cut may be required to be corrected to facilitate asphalt restoration. Pavement surface distortion shall not exceed 1/4 inch deviation in 10 feet. Measurements shall be made using a ten (10) foot long straight edge. Permittee shall provide a seal coat, grinding or approved repair if road restoration does not comply with tolerances.

K. Structures to Finish Grade: All manholes and other utility access structures shall be raised and collared as per Section 02438, "Structures to Finish Grade". The Engineer may approve the use of traffic control devices on residential streets if a ten (10) foot minimum lane width can be maintained, otherwise steel plating will be required. The plating shall be (1) one inch thick steel and shall be installed over the excavation and overlapped a minimum of (1) one foot on all sides and secured in place by tack welding or underpinning such to eliminate displacement of the plates. Permittee shall protect concrete with metal plating on all collector and arterial streets for a minimum of 3 days or until specified strength of the concrete is attained.

L. Street Striping Restoration: Permittee shall notify Sandy City Traffic Engineering of any street striping damaged, removed, or marred by construction operations. Sandy City Traffic Engineering may repair or approve permittee to repair damaged striping, but in either case cost shall be borne by permittee.

9.00 ENVIRONMENTAL CONTROL

A. Dust and Debris: Permittee shall control dust and debris at the work site, adjacent neighborhoods, and right-of-ways at all times. If necessary, wet down dusty areas with water

and provide containers for debris. The Engineer may issue a stop work order if dust and debris is not controlled. Immediate stop work order with penalties may be issued for tracking mud, soil or debris into a public way or for washing any contaminant or debris into any storm drain, ditch, channel, pipe or gutter, etc. To rescind the stop work order, the Engineer may require facilities to be installed such to prevent further tracking of soil or debris into any public way.

B. Noise: Construction activities shall be limited to normal working hours between 7:00 a.m. and 7:00 p.m. as identified by Sandy City ordinance, unless otherwise approved or restricted by the City.

C. Clean up: Permittee shall remove all equipment, material, barricades and similar items from the right-of-way. Areas used for storage of excavated material shall be smoothed and returned to their original contour. Vacuum sweeping or hand sweeping is required when the City determines current cleaning method is ineffective or inadequate.

10.00 GUARANTEES

A. Street Maintenance: After completion of the work, the permittee shall exercise reasonable care in inspecting and repairing any injury or damage to public and private facilities resulting from work done under the permit. The obligation of permittee to repair work done under the permit shall continue for a period of three (3) years following completion of said work, or in the event of repairs thereto, **two (2) years from the date of the repairs.**

1. Upon notice from Public Works, the permittee shall repair damage to public or private facilities resulting from damages or failure of work done under the permit. All repairs are to be done in-conformance with the Sandy City Standard Specifications or the utility owner as outlined by the Engineer, at the sole cost of the permittee.

2. In the event acceptable arrangements are not made by permittee within seven (7) working days after notice, Public Works may cause such repairs to be made and charge all costs including legal fees, penalties, time, equipment and material related costs to the permittee. By acceptance of the permit, the permittee agrees to comply with the above. The City will notify the permittee of costs prior to ordering or utilizing permittee=s bond with the City.

B. Liability Insurance: Permittee shall be responsible for any and all claims and liabilities for damages caused by any of the work permitted or caused by permittee=s failure to perform his obligations under the permit. In the event such claim for damages is made against or imposed upon the City, or any department, officer, or employee thereof, permittee shall, and by acceptance of the permit agrees to defend, indemnify and hold them harmless from such claim or liability in accordance with City Ordinance #97-25 “Excavation Permit.” The permittee agrees to take out such public liability insurance in the amount listed below:

Public Liability Insurance*

MINIMUM COVERAGE	MINIMUM AMOUNT
Per Occurrence	$1,000,000.00
Aggregate	$2,000,000.00

*The City may increase or decrease the minimum insurance limits based on the potential liability of the project.

A property owner performing work adjacent to his/her residence may submit proof of home owners insurance policy specifying limits similar to the insurance requirements of this section.

C. Bonds: The bond amount shall be a minimum of **$10,000.00** and shall remain in full force and effect for a period of three years from the date the work is completed. A single bond may be posted by a permittee to guarantee performance for one or more permits if approved by the City Engineer and agreed to, in writing, by the bonding company. The minimum bond amount shall be increased based on the number of permits issued to each permittee over the past three year period, as per the following chart, subject to review and approval of the City Engineer:

Number of Permits Past Three Years	Required Bond Amount
1-10	$10,000
11-20	$15,000
21-50	$20,000
51 or greater	$25,000

The City may require an additional bond upon determination by the City Engineer that the scope of the work exceeds the minimum bond amount, in which case, the total bond amount will be equal to the scope of the work as estimated by the City Engineer. Conditions, Requirements and Warranty shall comply with Ordinance #10-36.

END OF SECTION

SECTION 02577

PAVEMENT MARKING - AT GRADE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment as required to apply various types of pavement markings.

B. Obtain permit and provide traffic control as required.

1.02 RELATED WORK AND REFERENCES

A. Division 1 - General Requirements

B. Manual on Uniform Traffic Control Devices (MUTCD)

C. Federal Specifications L-S-300 - Sheeting and Tape, Reflective Non-exposed Lens, and Adhesive Backing

D. AASHTO M 247 - Glass Beads Used in Traffic Paints

E. AASHTO M 248 - Ready Mixed White and Yellow Traffic Paints

1.03 QUALITY ASSURANCE

A. Apply all striping and marking materials in accordance with the requirements of the Manual on Uniform Traffic Control Devices.

B. Apply all materials in accordance with the manufacturers direction and as directed by the Transportation Engineer.

1.04 WEATHER LIMITATIONS

A. Apply pavement markings only when the air temperature is above 40□ F. and during daylight hours.

B. Do not apply markings when it is raining or rain is anticipated within the next 12 hours.

END OF SECTION

SECTION O2669

WATER SUPPLY PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Inspection

B. Preparation

C. Water pipe installation

D. Valve and fitting installation

E. Thrust block installation

F. Corrosion protection

G. Field quality control

H. Metered Services

I. Pressure Reducing Stations

J. Fire Hydrants

K. Fire Lines

L. Disinfection

M. General

1. The work to be done consists of furnishing all necessary labor, materials and equipment to provide complete installation and testing of water system facilities. Modifications to existing facilities shall conform to Sandy City specifications.

2. The construction of water mains shall include: excavation, backfill and compaction, construction of concrete structures, anchors, thrust blocks, supports, encasements; furnishing, installing, testing and disinfecting water pipelines, fittings, valves, blow offs, air valves, services, fire hydrants, and all appurtenances; removal and restoration of existing improvements and all work in accordance with the project plans and specifications.

N. Unacceptable Work

1. Unacceptable work as determined by Engineer whether the result of poor workmanship, use of defective materials, materials not compliant with current codes, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner at the contractor's expense.

1.02 RELATED WORK

A. Regulations for Excavation on Sandy City Rights-of-Way.

B. Section 02220 - Excavation.

C. Section 02225 - Backfilling for Utilities.

D. Section 02438 - Structures to Finished Grade.

E. Section 02675 - Disinfection of Water Distribution Systems.

1.03 QUALITY ASSURANCE

A. Comply with federal, state, and local codes and regulations. Underground piping pressure testing shall be witnessed by the Engineer. All Fire Sprinkler/Suppression lines are to be tested in the presence of the Sandy City Fire Marshall.

B. Pipe, valve, and appurtenance materials and workmanship shall be in accordance with AWWA Standards or other standards as specified herein.

C. Pipe, valve, and appurtenance materials for ductile iron pipe (DIP) shall be new and shall be manufactured within five (5) years from time of installation. Pipe, valve, and appurtenance materials for PVC C-900 DR-14 shall be new and shall be manufactured within two (2) years from time of installation. Date shall be easily visible on all pipes.

1.04 REFERENCES

A. American Water Works Association (AWWA)

1. C104, “Cement Mortar Lining for Ductile Iron Pipe.”

2. C105, "Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids".

3. C111, "Rubber-Gasket Joints for Ductile-Iron and Gray-iron Pressure Pipe and Fittings".

4. C115, “Flanged Ductile Iron Pipe with Threaded Fittings.”

5. C151, "Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids".

6. C153, ”Ductile Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in. for Water Service.”

7. C502, “Dry-Barrel Fire Hydrants”.

8. C504, "Rubber-Seated Butterfly Valves".

9. C509, "Resilient-Seated Gate Valves for Water and Sewer Systems".

10. C600, "Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances".

11. C900, “Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12in., for Water Transmission and Distribution.”

12. C906, “Polyethylene Pipe and Fittings, 4 in. through 63 in. for Water Distribution”.

B. American Society for Testing and Materials (ASTM):

1. A126, “Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings”.

2. D2321, “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications”.

3. D2837, “Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products”.

4. D3350, “Standard Specification for Polyethylene Plastics Pipe and Fitting Materials”.

5. F714, “Standard Specification for Polyethylene Pipe Based on Outside Diameter”.

6. F2164, “Field Leak Testing of Polyethylene and Crosslinked Polyethylene Pressure Piping Systems Using Hydrostatic Pressure”.

7. F2620, “Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings”.

1.05 SUBMITTALS

A. Submit manufacturer's specifications for all products to Engineer for approval.

1.06 DELIVERY, STORAGE AND HANDLING

A. Load and unload pipe, fittings valves, and accessories by lifting with hoists or skidding so as to avoid shock or damage. Do not skid or roll pipe on skid ways against pipe already on the ground.

B. Each length of pipe shall be unloaded near the place where it is to be placed in the trench.

C. At times when pipe laying is not in progress, the open ends of the installed pipe shall be closed by a watertight plug or other means approved by the Engineer.

D. High Density Polyethylene Pipe: Pipe shall be stored on clean ground to prevent undo scratching or gouging. Sections of pipe with deep cuts or gouges shall be removed and ends of pipes rejoined. Lifting of joined pipe sections shall preclude concentration of bending stresses at joints and shall be done in a manner which evenly distributes lifting stresses along the full length of the pipe. Pipe shall be stored in a shaded area or covered to avoid temperature extremes which may cause the pipe to bow or warp.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

A. Buried Applications

1. Standard: AWWA C151.

2. Thickness Class 52 or better or as noted on project plans.

3. Cement lined and bituminous coated in accordance with AWWA C104.

4. Rubber gasketed slip-on pipe joints in accordance with AWWA C111.

5. Class 350 psi mechanical joint fittings in accordance with AWWA C153.

B. Above Ground Applications:

1. Same as buried applications except joints and fittings to be flanged in accordance with AWWA C115.

2. Gaskets to be full faced, 1/8 inch thick rubber.

2.02 POLYVINYL CHLORIDE PIPE

A. If the construction work is located west of the Utah Transit Authority's TRAX line and If directed by the Public Utilities Director Polyvinyl Chloride Pipe shall be used as the water line pipe.

B. Buried Applications Standard: AWWA C900 for pipeline 4 in. through 12 in. Water lines larger than 12 in. shall be Ductile Iron as specified above.

1. Pressure Rating (Class) – 305 psi (DR-14 Class) or as noted on project plans.

2. Rubber gasketed slip-on pipe joints in accordance with AWWA C111.

3. Mechanical joints shall be ROMAC Grip Ring. Mega lugs will not be allowed on PVC pipe.

4. Deflection in pipe joints shall not be allowed.

5. 10 gauge tracer wire shall be placed on top of the pipe (per Sandy City Standards Specifications) for future relocation.

2.03 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. Standard: ASTM D3350, AWWA C906.

B. Pressure Rating – 250 psi (DR-9) or as noted on project plans.

C. The HDPE shall have designation of PE 4710 (iron pipe size), made from resin with a minimum cell classification of PE 445474C.

D. Fittings shall be pressure rated to match the system piping to which they are joined. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall meet the outside diameter and minimum wall thickness specifications for the same size pipe.

2.04 ACCESSORIES

A. Nuts and Bolts as required.
B. Gaskets to be 1/8 inch full face rubber.
C. 8 mil. polyethylene wrap in accordance with AWWA C105.
D. Install 10 gauge locator wire on top of all PVC water mains.
E. Install 10 gauge locator wire on top of Ductile Iron pipe with 10" diameter or larger.

2.05 CORROSION PROTECTION

A. Bolts: Apply 2 coats of FM2 Grease (food grade) all exposed surfaces of bolts and to all bolt threads after installation of piping, fittings, valves, and couplings.

B. Encase all buried ductile iron valves, fittings, connections and specialties in minimum 8 mil. black polyethylene sheets in accordance with AWWA C-105. PVC tape shall be used to secure polyethylene sheets to the pipe.

C. Encase buried ductile iron pipe in minimum 8 mil. polyethylene sheets in accordance with AWWA C-105 in all areas and soil types as shown on the project plans or as specified by the Engineer.

2.06 VALVES

A. All valves shall be Mueller Clow or approved equivalent.

B. Gate Valves:

1. Ductile Iron Body: Mueller 350 Resilient Wedge Gate Valve or approved equivalent that conform to the requirements of AWWA C509, non-rising stem design with “O” ring seals. For 4” to 12”, American Flow Control Valve Series 2500 Resilient Wedge Gate Valve may be used, as approved by Public Utilities Inspector.

2. Operating Direction: Open counterclockwise.

3. Buried Valves: Flanged or mechanical joint as directed by the Engineer.

C. Tapping valves and sleeves:

1. Tapping valves shall have large diameter seat rings to permit entry of tapping machine cutters. Inlet shall be flanged. Outlet shall suit branch piping and shall include the required flange for tapping machine adapter connection. In other details, tapping valves shall conform to the requirements outlined for gate valves in Paragraph 2.04 A.

2. Tapping sleeves shall be suitable for assembly around the existing main. Body shall be high strength ribbed construction. End gaskets shall be sized to suit the existing main, and the seals between the pipe and the gaskets shall be formed around the perimeter of the pipe.

3. Tapping valves and sleeves shall be stainless steel fully gasketed.

D. Butterfly valves (16" and Larger): Subject to approval by the Engineer prior to installation.

1. Shall comply with the requirements of AWWA C504, Class 150 B.

2. Valve bodies shall be cast conforming to ASTM A126, Class B. Ends shall be flanged unless otherwise specified.

3. Valve discs shall be streamlined and shall have a continuous 360□ sealing surface of stainless steel, ASTM A276, type 304.

4. Valve shafts shall be stainless steel ASTM A276, type 304, of stub construction with at least 12 times the shaft diameter engagement into the disc and shall be fastened to the disc with upset pins.

5. Valve seats shall be of Buna N material bonded to the valve body.

6. Valve bearings shall be self-lubricating and non-corrosive and shall have a significant difference in hardness from the valve shaft.

7. Valve actuators shall be designed as an integral part of the valve and shall meet all the requirements of AWWA C504. All actuators shall be hermetically sealed and permanently lubricated with no exposed moving parts. All manual actuators will meet the requirements of AWWA C504 for nut input.

2.07 VALVE BOXES AND ADAPTOR (See Standard Detail Figure 5)

A. Valve boxes shall be suitable for HS-20 traffic loading.

B. Valve boxes and valve box adaptors shall be furnished and installed over each line valve and over each auxiliary hydrant valve. All buried valves shall be installed complete with a D&L Supply M-8040 slip valve box. Valves over 5' in depth shall have a valve nut extension stem installed

C. All valve box risers shall be D&L Supply only.

D. All valve boxes require a valve box adaptor. Valve box adaptors shall be Mueller or Clow only.

2.08 FITTINGS

A. Mechanical joint:

1. Mechanical joint fittings shall be Ductile Iron Class 350 psi and shall conform to AWWA C-153 and C-111. Mechanical joint fittings shall be coated with a petroleum asphaltic coating 1 mil thick. All mechanical joints require a domestic joint restraint.

B. Flanged fittings:

1. Flanged fittings shall conform to AWWA C-111 Ductile Iron Class 350 psi fittings. Flanges shall be faced and drilled and shall be Class 150 unless otherwise noted on the plans or as required by the Public Utilities Inspector. Flanged fittings shall be coated with a petroleum asphaltic coating 1 mil thick.

2.09 METERED SERVICES

A. 3/4" Service Laterals (see Standard Detail Figure 1):

1. All supplies, labor, machinery, etc. will be supplied by the contractor. Sandy City will supply and set the meter only on 3/4" and 1" connections. The contractor shall supply meters for connections greater than 1".

2. Brass corporation stops Mueller B-25008 or equivalent. Tap directly into the DIP water main. Saddles are required for PVC water mains. All corps shall be CC thread. No saddles are allowed on ductile iron mains.

3. Type K soft drawn copper pipe installed as one solid piece from main to meter.

4. Copper Tube Size (CTS) ply pipe shall be installed from setter and extend a minimum of 12”

5. 18" meter yokes. Mueller 240-B-2434----26, Ford VB 73-18W-11-33-7.5 or approved equivalent.

6. 18" diameter x 30" high white ADS N-12 meter box.

7. 18" cast iron ring and lid with locking nut (D&L 2240-16).

B. 1" Service Laterals (see Standard Detail Figure 1):

1. The specifications and installation of 1" services shall be the same in every respect as 3/4" services (Item 1 to 4), except that all materials shall be sized appropriately.

2. 18" meter yokes. Mueller B2434 -01018 or Ford VB 74-18WT-11-44.

3. 21" diameter x 30" high white ADS N-12 meter box.

4. Cast iron ring and lid with locking nut (D&L 2240-16).

C. 1-1/2" and 2" Service Laterals (see Standard Detail Figure 8):

1. All supplies, labor, machinery, etc. will be provided by the contractor. Sandy City does not provide or set the meter if it exceeds 1" in size.

2. Type K soft drawn copper pipe installed as one solid piece from main to meter.

3. Copper Tube Size (CTS) poly pipe shall be installed from setter and extend a minimum of 12" beyond sidewalk.

4. Brass screw type fittings (ball valves, strainers, nipples, tees, bends, etc.).

5. Sensus meters:
   a. 1 1/2" and 2" shall be Sensus Omni C^2 meter with electronic AMR Register programmed to read in 1,000 gallon.

6. Concrete meter vault with 24" cast iron ring and lid suitable for HS-20 traffic loading. Lid shall be D&L A1180-SP-Dish.

7. Meter vault to have gravel floor and gravel drain sump with personnel access manhole and steps. See Sandy City Standard Details, Figure 8.

8. Meter assembly shall be supported by two (2) jack stand (see Figure 11) pipe supports placed on 18" x 18" x 4" concrete pads.

9. Saddles must be used to connect to all water main. Saddles shall be double brass strap.

D. 3" Service Laterals (see Standard Detail Figure 9):

1. All supplies, labor, machinery, etc. will be provided by the contractor. Sandy City does not provide or set the meter if it exceeds 1" in size.

2. 4” ductile iron pipe.

3. 4” ductile iron, flanged gate valves and fittings.

4. Concrete meter vault with 24" cast iron ring and lid suitable for HS-20 traffic loading. Lid shall be D&L A1180-SP-Dish.

5. Meter shall be a Sensus Omni C^2 meter with an electronic AMR Register programmed to read in 1,000 gallon.

6. Meter box to have gravel floor and gravel drain sump with personnel access manhole and steps. See Sandy City Standard Details, Figure 9.

7. A 3" X 4" flanged reducer shall be bolted on either side of the 3" meter. All other piping shall be 4" Ductile Iron.

8. Meter shall be supported as shown in Standard Detail Figure 9 by screw jack pipe supports placed on 18" x 18" x 4" concrete pads.

E. 4" and Larger Service Laterals: (see Standard Detail Figure 10)

1. All supplies, labor, machinery, etc. will be provided by the contractor. Sandy City does not provide or set the meter if it exceeds 1" in size.

2. 4” ductile iron pipe.

3. Ductile iron pipe, flanged gate valves and fittings.

4. Concrete meter vault with 24" cast iron ring and lid suitable for HS-20 traffic loading. Lid shall be D&L A1180-SP-Dish with gravel floor and gravel drain sump with personnel access manhole and steps.

3. Meter shall be a Sensus Omni C^2 meter with electronic AMR register programmed to read in 1,000 gallon.

4. Meter shall be supported as shown in Standard Detail Figure 10 by screw jack pipe supports placed on 18"x18"x4" concrete pads.

F. At locations where service lateral piping passes through meter box wall, 3/4" jack stand plywood backing is to be placed around the pipe (outside box) and sealed around the pipe from the inside with poly-urethane expanding foam.

G. All service laterals are to have 48 inches minimum cover and are to be installed using one seamless section of pipe (if copper) from the water main to the meter. Pipe cover is to be adjusted in the vicinity of the meter box to allow for proper meter height in box.

2.10 PRESSURE REDUCING VALVE STATIONS (See Standard Detail Figure 12)

A. All pressure reducing valves (PRV) shall be Clay-val Pressure Reducing and Pressure Sustaining Valve, 150 lb Flanged, Globe Pattern, CRL S.R. 20-200, CRD S.R. 30-300 with inlet and outlet pressure gauges 0-300 PSI with X101 Valve Position Indicator (Model # 92-01BVKC).

B. All valves to be ductile iron bodies, stainless steel internal trim, bronze pilots stainless steel tubes & fittings with stainless steel ck'2s Epoxy lined & coated.

C. On PRV's over 6" diameter, a low flow PRV in excess of 2" diameter may be required.

D. Vault:

1. Vault shall have a concrete floor with a galvanized grated floor drain connected to a 4' square by 5' deep coarse gravel sump unless a drain to daylight can be provided. The floor drain shall be located near the access lid and the floor shall slope towards the sump (2% slope minimum).

2. Vault shall have 6'6" clearance between the floor and ceiling of the vault.

3. Vault shall have two access lids:

a. A 36" diameter clear opening manhole ring and lid shall be centered over the PRV to provide easy access for possible removal. Ring and lid shall be D & L Supply A-1460.

b. A 24" diameter clear opening manhole ring and lid shall be located at a corner of the vault. Ring and lid shall be D&L Supply A-1181 or equivalent. All access lids (personnel lids) must be accompanied by a ladder either poured into or securely fastened to the vault wall. All ladders will have rungs not farther than 1' apart. Steps poured into the vault wall shall be rubber coated as are found in pre-poured sewer cones and sections. Ladders fastened to the walls shall have lag bolts not farther than 2' apart and the ladder shall be bolted on both sides.

c. The vault shall have min. 8" thick walls. Wall and roof shall have steel reinforcement designed for HS-20 traffic loading.

d. In addition to supports under the fittings, the two tees on the bypass line shall be braced against the vault walls by means of jack stands.

4. See Standard Detail Figure 12 for PRV general specification details.

2.11 FIRE HYDRANTS (See Standard Detail Figure 2)

A. All fire hydrants shall be red in color and shall be one of the following 6" compression type hydrants:

1. Mueller “Centurion”

2. Clow “Medallion”

B. Auxiliary valves complete with valve box. All auxiliary valves shall be flanged to the main. In cases where the distance from the main to the hydrant is greater than 6' an additional auxiliary valve shall be flanged to the hydrant (see Figure 2). Valves shall conform to Standard Detail Figure 5.

C. Gravel for sump.

D. All hydrants shall conform to AWWA Specifications C-502.

E. Hydrant shall be equipped with two 2 1/2" hose nozzles and one 5 1/4" nozzle, and nozzles shall have the national standard threading.

F. Each hydrant shall be supplied with O-ring seals and a national standard pentagon operating nut designed for clockwise rotation closing.

G. Auxiliary valve shall conform to Sandy City Specification for gate valves (see Standard Detail Figure 5). The water line from the main to the hydrant shall be 6" minimum.

H. Blocking shall conform to Sandy City Specifications for thrust blocking (see Standard Detail Figure 7).

I. Existing hydrants required to be raised, lowered or repaired shall be done by a qualified pre-approved contractor.

J. Any existing fire hydrant that is shown on plans to be relocated shall meet current standards or be replaced with a new hydrant that meets current City standards at no cost to Sandy City Public Utilities. Fire hydrant extension is not allowed without approval from Public Utilities.

2.12 FIRE SPRINKLER/SUPPRESSION LINES

A. All fire lines must be equipped with a flanged by mechanical joint gate valve complete with valve box where line attaches to the main. The valve shall conform to Sandy City specifications for gate valves.

B. All fire lines shall be Ductile Iron Pipe Thickness Class 52 ductile iron pipe. Fire lines shall meet Sandy City's specifications for main lines.

C. All fire lines are to be wrapped in 8 mil. Polyethylene bag.

D. Fire line locations shall be approved by Sandy City.

E. Notify Sandy City Water Inspector two working days prior to installation.

F. No services shall be connected to the fire sprinkler/suppression lines.

PART 3 EXECUTION

3.01 INSPECTION

A. All pipe fittings, valves and other appurtenances shall be examined by Contractor carefully for damage and other defects immediately before installation.

B. Defective materials shall be marked and held for inspection by Engineer, who may prescribe corrective repairs or reject the materials.

C. Prior to installation, valves shall be inspected for direction of opening, freedom of operation, tightness of pressure-containing bolting, cleanliness of valve ports and seating surfaces, handling damage, and cracks. Defective valves shall be corrected and be approved by Public Utilities Inspector prior to installation.

3.02 PREPARATION

A. Furnish temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work.

B. The trench bottom and pipe bedding surface shall be prepared in accordance with Section 02220 - EXCAVATION, Section 02240 - BACKFILL, COMPACTION, AND EMBANKMENT.

C. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid. Bevel and file plain end of pipe to prevent gasket damage during joint assembly.

D. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, and valves shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water-main materials and protective coatings and linings. Under no circumstances shall water system materials be dropped or dumped into the trench.

3.03 HANDLING OF PRESSURE PIPE

Lift pipes with mechanical equipment using wide belt slings or a continuous fiber rope which avoids scratching the pipe. Do not use cable slings or chains. Pipes up to 12-inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6-inches in diameter can be lifted by hand.

3.04 WATER PIPE INSTALLATION

A. The water pipe shall be laid and maintained to lines and grades established by the drawings and specifications with fittings and valves at the required locations unless otherwise approved by the Engineer. Unless otherwise shown, all water lines shall have 4.0' minimum, 5.0' maximum cover to final finish grade. All main lines are to be located 4' off the lip of the north or east curbs unless otherwise specified. All valves and fire hydrants are to be installed on lot corners and/or curb PC's or as noted on the approved plans.

B. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Engineer to provide clearance as required by federal, state, or local regulations or as deemed necessary by the Engineer to prevent future damage or contamination of either structure.

C. Lay all water lines on a continuous grade to avoid high points except as shown on the plans.

D. Prevent foreign material from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe. If the pipe-laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over each end and left there until the connection is to be made to the adjacent pipe.

E. As each length of pipe is placed in the trench, the joint shall be assembled in accordance with manufacturer's recommendations.

F. The pipe shall be brought to correct line and grade, and shall be secured in place with approved backfill material in accordance with specifications found under Paragraph 3.02.B above. Water pipe shall be bedded with six (6) inch minimum of sand. The contractor shall also place 12" of sand over the pipe.

G. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or plumb stems or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that recommended by pipe manufacturer and shall be approved by the Engineer. **No deflection is allowed for PVC pipe**.

H. At times when pipe laying is not in progress, the open ends of installed pipe shall be closed by a watertight plug or other means approved by the Engineer. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water.

1. Cutting pipe for the insertion of valves, fittings, or closure pieces shall be done in a neat manner without creating damage to the pipe or lining.

J. Cut ends and rough edges shall be ground smooth. For push-on joint connections, the cut end shall be beveled.

K. Whenever possible, all tie-ins will be made dry. Engineer shall turn off the water upon two working days **minimum** advance notice by the contractor to the Engineer. It shall be the contractor's responsibility to advise all affected water users of the interrupted service a **minimum** of 24 hours prior to any service interruption. In large areas where there is heavy use, where shutting down the line is not feasible in the opinion of Engineer, the contractor shall be required to tie onto the main by using a wet tap.

L. All dead ends shall be plugged complete with a 2" wash out assembly (see Standard Detail Figure 3), or fire hydrant where feasible.

M. In no instance shall another utility be laid within 18" above and 12” below the waterline. Any closer than 3' shall require the approval of the Engineer (see Public Utilities Conflict Policy).

N. HDPE: Sections of pipe shall be joined into continuous lengths by the butt fusion method and shall be performed in strict conformance with the pipe manufacturer’s recommendations using approved equipment. Sections of pipe shall be as long as practical to minimize the number of joints. Pipe shall be installed, backfilled, and allowed to acclimatize to the typical soil temperatures prior to connection to other piping systems.

3.05 VALVE AND FITTING INSTALLATION

A. Valves shall be as shown in Standard Detail Figure 5.

B. Valve-operating stems shall be oriented in a manner to allow proper operation.

C. A valve box and valve box adaptor shall be provided for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box and valve box adaptor shall not transmit shock or stress to the valve and shall be centered over the operating nut of the valve, with the box cover set in accordance with Section 02438. In paved areas, a concrete collar around the valve box is required. See Standard Detail Figure 5 for concrete collar detail. Concrete shall be a minimum of 4000 psi in 28 days.

D. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

3.06 THRUST BLOCK INSTALLATION

A. Thrust blocks shall be provided at reducers, valves, tees, plugs, and caps, and at bends deflecting 11-1/4 degrees or more.

B. Thrust block shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that shown on the drawings. The block shall, unless otherwise shown or directed, be so located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.

C. Concrete for thrust blocks shall have a compressive strength of not less than 3000 psi in 28 days.

D. Care shall be taken to not pour concrete around bolts.

E. Ductile Iron and PVC Pipe: Refer to Standard Detail Figure 7 for thrust block details.

F. HDPE: Refer to Standard Detail Figure 13 for thrust restraint block details.

3.07 CORROSION PROTECTION

A. Bolts: Apply 2 coats of no oxide wax to all exposed surfaces of bolts and to all bolt threads after installation of piping, fittings, valves, and couplings.

B. Encase all buried ductile iron valves, fittings, connections, and specialties in minimum 8 mil. polyethylene sheets in accordance with AWWA C-105.

C. All buried ductile iron pipe and fittings shall be poly-wrapped with 8 MIL of polyethylene in accordance with AWWA C-105. All bolts and nuts shall be greased with FML food grade grease. See Water Figure 15 on how to install poly sleeves.

3.08 3/4" AND 1" SERVICE LATERALS

A. Meter box shall be installed in a landscape area and a location so that proper elevations of the meter box are achieved.

B. Locate all laterals as close as possible to the center of the lot, out of drive approaches and have all meter locations cleared with the Engineer.

C. All meters shall be located between the curb and the sidewalk unless approved otherwise by the Engineer.

D. Corporation stops shall be tapped at 45 degree angles (see Standard Detail Figure 1) unless approved otherwise by the Engineer. The corp stop shall have wood blocking under it to minimize any settlement. Along with the wood block the contractor shall firmly compact dirt around and under the corp; also acceptable is a wood block placed under the copper loop with dirt compacted firmly about corp and loop.

E. Type K soft copper shall be connected to the top of the water main at a 45 degree angle. All tubing shall be cut straight and reamed.

F. A small loop (goose neck) of excess copper must be put in the copper tubing to accommodate settlement that may occur (see Standard Detail Figure 1).

G. All laterals must be of one continuous copper tube between the corp stop and the meter box. No joints or copper to copper connectors will be allowed.

H. All laterals shall have a minimum of 48" cover from top of copper tubing to finished grade.

I. All yokes shall be as shown on Standard Detail Figure 1.

J. From the top of the lid (cast iron) to top of the shut off valve on the yoke, there must be a distance of not less than 15" or more than 20". No meter will be set if this or any other specification is not met (See Standard Detail Figure 1).

K. All pig-tails will be poly pipe and will be stubbed into the property a minimum of 1'.

L. All meter boxes shall be centered squarely over the yoke to provide access to the connection nuts on the bottom of the yoke. Meter box interior shall be kept clear of dirt so that connecting nuts are visible.

M. All meter boxes will be installed so the lid of the meter box will be between 1/2” above or below the curb after settlement has occurred.

N. See Standard Detail Figure 1 for typical installation detail.

O. Precautions should be used to prevent any foreign materials from entering the pipe. All pig-tails will be smashed on the end which is stubbed into the property. Contractor will make every effort to ensure that no kinks or restrictions occur in the service.

P. The Engineer may require the fitting on the cold side of the yoke to be tested by inserting a jumper in between the yoke. Jumper shall be complete with gaskets and will be installed and ready for inspection prior to calling for inspection.

Q. Copper laterals shall be bedded in sand. The sand bedding shall be a minimum of six (6) inches below and one (1) foot above the pipe.

3.09 1 1/2" AND 2" SERVICE LATERALS

A. All meter boxes shall be set in a landscaped area or an area approved by the Engineer with the lid even with the surrounding landscaping. Riser rings will not be allowed and lid shall not be located in a depressed area.

B. All meter vaults shall have a gravel base (floor) not less than 18" thick.

C. The meter shall be a minimum of 36" and a maximum of 42" from the top of the access lid (see Standard Detail Figure 8). In cases where the main water line is deeper, the service lateral will be raised to conform to this specification.

D. The bypass shall be the same size as the metered line.

E. The area where the pipe comes into and out of the vault shall be grouted to prevent debris from washing into the box.

F. No sprinkler systems or backflow devices shall be tied into the line inside of the meter vault.

G. The box must be designed for HS-20 traffic loading and be equipped with an appropriate cover approved by the Engineer.

H. 1 1/2" and 2" taps to the main line shall be made with a saddle. Saddles shall be brass and have a minimum of two straps which hold the saddle to the main. On 1 1/2" and 2" taps only, a compression type corporation stop with a lock ring is acceptable. Saddle is to be wrapped in polyethylene.

I. See Standard Detail Figure 8 for typical meter installation detail.

3.10 3" AND LARGER SERVICE LATERALS

A. All meter boxes shall be set in a landscaped area, or as approved by the Engineer, with the lid even with the surrounding landscaping. Riser rings will not be allowed.

B. The meter vault shall have a gravel base (floor) not less than 18" in depth.

C. In case of extreme depth (over 36 inches) a ladder shall be poured into or securely fastened to the vault wall. The access lid shall be moved so that it is centered over the ladder.

D. The bypass shall be the same size as the metered line unless otherwise approved by the Engineer.

E. No sprinkling system or back-flow devices shall be tied inside the meter vault. Such tie-ins must be made on the property owners side of the meter station and **outside the vault.**

F. The box must be designed for HS-20 traffic loading and be equipped with an appropriate lid approved by the Engineer.

G. Wall clearance as shown in Standard Detail Figures 9 and 10 shall be strictly adhered to.

H. See Standard Detail Figure 9 and 10 for typical installation detail.

3.11 FIRE HYDRANT INSTALLATION

A. Fire hydrant shall be installed so that the flange is a minimum of 2" and a maximum of 5" **above** the top back of curb.

B. The trench for the hydrant shall be slightly over excavated to provide a 2 cubic yard gravel sump.

C. Concrete blocking shall be set behind the hydrant and a 18" X 18" X 4" thick piece of concrete shall be placed under hydrant for support.

D. The drain holes shall not be covered by the concrete blocking.

E. All hydrants shall be level both at the side and at the back.

F. All hydrants shall be turned on after installation and inspected by Sandy City Fire Department for proper operation.

G. Install 4'x5' concrete pad around fire hydrant.

H. See Standard Detail Figure 2 for Fire Hydrant Connection Detail.

3.12 TRACER WIRE TESTING

Upon completion of the pipe installation, it shall be demonstrated that the wire is continuous and unbroken through the entire run of the pipe.

A. Demonstration shall include full signal conductivity (including splices) when energizing for the entire run in the presence of Public Utilities Inspector.

B. If the wire is broken, the wire shall be repaired or replaced. Pipeline installation will not be accepted until the wire passes a continuity test.

3.13 FIELD QUALITY CONTROL

A. Temporary connections for pressure testing shall be made by the Contractor at his expense and removed by him after the satisfactory completion of the testing work.

B. Pressure Test – Ductile Iron and PVC Pipe:

1. After completion of the installation of the system, or any reasonable length thereof, prior to backfilling and after thorough flushing of the portion to be tested, pressure tests shall be made. The system to be tested shall be subjected to a hydrostatic pressure of 200 pounds per square inch, unless otherwise noted on the drawings, for a period of not less that 2 hours duration.

2. The portion to be tested shall be filled with water slowly and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall make the temporary connection for pressure testing.

3. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation stops at such points so that the air can be

expelled as the line is filled with water. After all the air has been expelled, the corporation stop shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation stops shall be removed and plugged by the Contractor with a brass plug.

4. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer, at no cost to the City.

C. Pressure Test – HDPE Pipe:

1. Testing prior to pipe installation outside of the trench.

Test all piping either in sections or as a unit. The test shall be made by placing temporary bulkheads as needed in the pipe and filling the line slowly with water. Care shall be taken to see that all air vents are open during the filling. After the piping or section thereof has been filled, subject the pipe to a hydrostatic test pressure equal to 225 psi for a maximum of 4 hours. During this time, add water periodically to maintain the test pressure; this compensates for the initial stretching of the pipe. The line-pressure tightness is determined by visual observation; therefore, it is not necessary to measure the make-up water. Examine every fused joint; any leakage must be repaired and then retested.

2. Testing in the trench.

a. Filling: Fill the pipeline slowly with water after it has been laid and bleed off any trapped air.

b. Initial Expansion Phase: Gradually increase pressure in the test section to the test pressure of 225 psi. During this initial expansion test phase, sufficient make-up water must be added to the system at hourly intervals to maintain the maximum test pressure for 4 hours. After the 4 hours of initial expansion, the actual Test Phase can start.

c. Test Phase: Reduce test pressure by 10 psi and monitor pressure for 1 hour. Do not increase pressure or add make-up water. If the pressure then remains within 5% of the target value for 1 hour, this indicates a passing test.

d. Under no circumstances shall the total time under test exceed eight hours at 225 psi. If the test is not complete within this time limit (due to leakage, equipment failure, etc.), the test section shall be permitted to “relax” for eight hours prior to the next test sequence.

D. Disinfection of Water Distribution Systems:

Refer to Section 02675.

END OF SECTION

SECTION 02675

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Flushing of water distribution system and supply lines

B. Chlorine disinfection

C. Final flushing

1.02 QUALITY ASSURANCE

A. All disinfection and testing procedures shall be in accordance with applicable Federal, State, and local standards, and in accordance with applicable provisions of AWWA C651.

1.03 REFERENCES

A. American Water Works Association (AWWA).

1. C651 - Disinfecting Water Mains.

2. B300 - Standard for Hypochlorites.

3. B301 - Standard for Liquid Chlorine.

B. "Standard Methods for Examination of Water and Wastewater", American Public Health Association, AWWA, and Water Pollution Control Federation.

C. "Utah Administrative Code" Section R309.

1.04 SUBMITTALS

A. Results of chlorine residual tests.

B. Results of bacteriological quality tests.

PART 2 PRODUCTS

2.01 CHLORINE

A. Sodium Hypochlorite:

1. Shall be in accordance with AWWA B300.

2. Shall be stored as recommended by manufacturer.

B. Calcium Hypochlorite:

1. Shall be in accordance with AWWA B300.

2. Shall be in granular or tablet (5 gram) form.

3. Shall be stored in a cool, dry, and dark environment or as recommended by manufacturer.

C. Liquid shall conform to AWWA B301.

PART 3 EXECUTION

3.01 PREPARATION

A. Notify Engineer at least three working days prior to any flushing or disinfecting.

B. Contractor shall install temporary connections for flushing water lines after disinfection. After the satisfactory completion of the flushing work, the Contractor shall remove and plug the temporary connection.

3.02 TABLET METHOD

A. Tablet Method PG AWWA C651-92, Section 5.1

B. The tablet method consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and filling the main with potable water when installation is completed.

C. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

D. Placing of calcium hypochlorite granules: During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals. The quantity of granules shall be as shown in Table 1. Warning: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

TABLE 1
Ounces of Calcium Hypochlorite Granules to be Placed
at Beginning of Main and Each 500-ft Interval

Pipe Diameter (in.)	Calcium Hypochlorite Granules (oz.)
4	0.5
6	1.0
8	2.0
10	3.0
12	4.0
16 and larger	8.0

E. Placing of calcium hypochlorite tablets: During construction, 5 gram calcium hypochlorite tablets shall be placed in each section of pipe and also one such tablet shall be placed in each hydrant, hydrant branch main, and other appurtenances. The number of 5 gram tablets required for each pipe section shall be $0.0012d^2L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by an adhesive such as Permatex No. 1, or equal. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

F. When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 ft/s. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41 degrees F, the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the treated main will not flow into water mains in active service.

TABLE 2

Pipe Diameter, Inches	Length of Pipe Section, ft.				
	13 or less	18	20	30	40
	Number of 5 gram Calcium Hypochlorite Tablets				
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13
20	5	8	10	14	18

* Based on 3.25 g available chlorine per tablet (65% available chlorine per 5 gram tablet); any portion of tablet rounded to next higher number. Dose of 25 mg/l required.

3.03 ALTERNATIVE METHODS

A. Alternative disinfection methods:

1. Continuous-Feed Method PG AWWA C651-92, Section 5.2.

2. Slug Method PG AWWA C651-92, Section 5.3

3.04 FINAL FLUSHING

A. Clearing the main of heavily chlorinated water. A chlorine residual test shall be conducted after chlorinated water has been resident in the pipe for not less than 24 hours. The chlorine residual shall be at least ten (10) ppm. It is the contractor's responsibility to schedule this test with the appropriate city personnel.

1. After meeting the applicable retention period, and passing of the chlorine residual test, the chlorinated disinfection water shall be drained from the line.

2. Flushing shall continue until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system.

B. Disposing of heavily chlorinated water:

1. The environment to which the chlorinated water is to be discharged shall be inspected. Do not discharge to any fish habitat, storm drain, agricultural lands or other location where damage may occur.

2. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.

3. Contractor to comply with Federal Clean Water Act. If necessary, secure permission from Utah "DEQ" or County Health Department for disposal of heavily chlorinated water.

3.05 BACTERIOLOGICAL SAMPLING AND TESTING

A. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulfate. A sampling tap shall be provided by the Contractor. Engineer shall be responsible for sampling and bacteriologic analysis by a certified testing laboratory. Contractor to give minimum two working days notice to Engineer prior to required sampling.

B. Water line:

1. After final flushing and before the water main is placed in service, a sample shall be collected from the water line and tested for the absence of coliform organisms in

accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater". The testing shall be by either the multiple tube fermentation technique or the membrane filter technique.

2. All samples shall be taken from a sampling tap or fire hydrant at a representative point on the system.

3. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained.

4. If check samples show the presence of coliform organisms, then the main shall be re-chlorinated by the continuous-feed or slug method of chlorination until satisfactory results are obtained.

5. High velocities in the existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, water entering the new main shall also be sampled.

6. When the samples are satisfactory, the water line may be placed in service upon receiving written notification from Engineer to do so.

3.06 DISINFECTION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

A. The following procedures apply primarily when mains are wholly or partially dewatered. After the appropriate procedures have been completed, the main may be returned to service prior to completion of bacteriological testing in order to minimize the time customers are out of water. Leaks or breaks that are repaired with clamping devices while the mains remain full of pressurized water present little danger of contamination and require no disinfection.

1. Trench treatment: When an old main is opened, either by accident or by design, liberal quantities of hypochlorite shall be applied to open trench areas.

2. Swabbing with hypochlorite solution: The interiors of all pipe and fittings (particularly couplings and sleeves) used in making the repair shall be swabbed or sprayed with a 1-percent hypochlorite solution before they are installed.

3. Flushing: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.

3.07 SPECIAL PROCEDURE FOR CAULKED TAPPING SLEEVES

A. Before a tapping sleeve is installed, the exterior of the main to be tapped shall be thoroughly cleaned, and the interior surface of the sleeve shall be dusted with calcium hypochlorite powder, at the rate of 100 mg per square foot.

END OF SECTION

SECTION 02700

PAINT REMOVAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, and equipment, to include self-contained power source and portable water reservoir, as required to remove paint from concrete and asphalt surfaces.
B. Capture and disposal of all runoff.
C. Protect private property as appropriate.
D. Provide traffic control, to include devices and trained personnel, in accordance with the current MUTCD and approved Traffic Control Plan.

1.02 RELATED WORK AND REFERENCES

A. Division 1 – General Requirements
B. Section 07900 – Protection of Trees, Lawns and Landscaping

PART 2 PRODUCTS

All materials and equipment shall be subject to the Engineer's approval before any work can begin.

PART 3 EXECUTION

3.01 WORK

A. All work must conform to OSHA standards.
B. Unless approved by the Engineer, do not perform work when the temperature is 40 degrees F or less.
C. Paint shall be removed to the percent specified by the Engineer using the following criteria:

1.	Removal of obsolete markings	95-100%
2.	Removal of existing when updating/changing marking	90-100%
3.	All other removals	80% minimum

3.02 POWER WASHING SURFACES

The primary and preferred means for removing paint is power washing with water. The water shall be collected by vacuum to prevent it from entering the storm drain system. The Contractor shall repeat the cleaning process as needed in areas where paint is still visible. If the cleaning process fails to remove the paint to the Engineer's satisfaction, the equipment and methods used by the Contractor will again be subject to review and approved by the Engineer.

3.03 ABRASIVE BLASTING

Due to the potential of damage to the surface by abrasive blasting, this method of removal may be used only at the direction of the Engineer after all other methods have been considered. Paint should be removed using vacuum-shrouded blasting or power-tool equipment that has the appropriate attachments for the surface being cleaned to ensure that no dust or abrasive escapes during operation. This equipment should be capable of cleaning all paint off the surface at a rate acceptable to the engineer while producing no detectable dust. The equipment should operate in a manner such that all dust or abrasive/dust mix generated is simultaneously drawn away from the contact surface into attached vacuum hoses leading to a vacuum that utilizes filters. The vacuum and its hoses should be sufficiently rated for the volume of debris and/or abrasive/debris generated. The equipment, its method of use, and efficiency shall be demonstrated to the Engineer prior to the start of work. Power tool cleaning should remove the paint without causing undue damage to the surface being cleaned.

PART 4 WASTEWATER MANAGEMENT

Pressure washing wastewater must be controlled. It is illegal to discharge wastewater to the storm drain system. The Contractor will contain, collect and dispose of wastewater.

END OF SECTION